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INSECTS
AND
THEIR HABITATIONS.

A BOOK FOR CHILDREN.

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The following heads of contents may be readily converted by the teacher
into a series of questions for the examination of pupils

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INSECTS

AND

THEIR HABITATIONS.

WE may learn many useful lessons from the history of insects; and by observing them, we shall find that they set us an example of various good habits. Though they are among the smallest of God's works, yet His power and wisdom visibly shine forth in them; and we shall see fresh cause, as we proceed, to adore the great and wise Creator, who formed them out of nothing.

You know, I suppose, what sort of thing an *insect* is;—almost all *very* little creatures are called by this name,—ants, spiders, caterpillars, bees, are insects. There are many other kinds, more than can be counted; I shall mention only a few particulars respecting some of the most curious, and shall chiefly speak of the ingenious manner in which they build their houses. Perhaps you are surprised to hear of their having houses, and wonder what can be meant; but I assure you they make their dwellings with quite as much skill as we can employ in making ours, and no bricklayer or carpenter could do his work more neatly than they do theirs. Where, you may ask, can these houses be? If you think for a moment, you will probably recollect having seen a bee-hive, or a wasp's, or an ant's nest; these

are all insect habitations. The spider's-web too may be called his house, and a very beautiful and curious one it is. But what will you say, if I tell you that the oak-apples you are so fond of sticking in your hat on the twenty-ninth of May, and the pretty green and red tufts, like moss, which you find upon the wild briar, are made by insects as a home for their young! All this is true however; and now where shall we begin our explanation and account of these wonderful things?

BEEES.



WORKING-BEE.



QUEEN-BEE.



DRONE.

The HONEY-BEE surely deserves the first place. Its abode is like a palace compared with most other insect-houses; indeed, from the number of its inhabitants, we may more properly call it a city. The industry, too, of this little creature is such, as to give it a strong claim upon our attention; and I dare say you have often watched it flying from flower to flower, and returning home heavily laden with yellow dust. The bee has many good qualities besides diligence, to render it a favourite, and these we shall see as we go on with its history.

You most likely have seen a honey-comb, and tasted the sweet liquid it contains. Do you not think it very wonderful, that small insects should

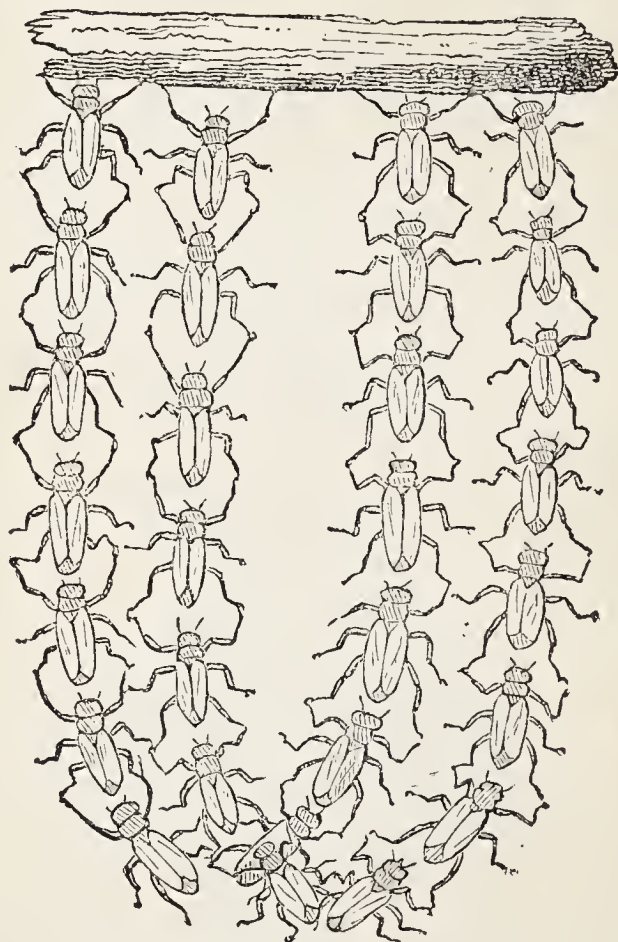
be able to make wax and honey; neither of which men have the power of making? How much labour too must it cost to build and fill the numerous cells! Let us follow a colony of bees through the various tasks they have to perform, and we shall see with what surprising instincts they are endowed.

Many countries abound with *wild* bees, and these form their own nests; but here we keep them under an artificial covering called a hive, which is made of straw, and like that figured below. These hives have a little opening on one side, for the bees to go in and out at; they generally stand upon a wooden bench, and in cold weather are placed under some sort of shed.



A swarm of bees, on entering a new hive, immediately want cells, or little chambers, in which to store up their honey, and bring up the young. These cells cannot be made without wax; the first business, therefore, is to obtain that substance. You probably suppose that the bees collect it from flowers, and that they will go out and fetch home a store. But no, they seem to be quite idle, and hang in long rows, like garlands, or strings of beads; one at each end taking hold of the roof, the rest clinging

to each other's legs, and so they remain for four-and-twenty hours without moving.



BEES CLUSTERING.

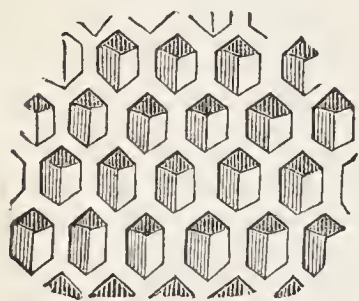
This does not proceed from laziness, however, nor are they waiting to think what must be done; you will never guess why they hang thus, so I must tell you. Wax, instead of being found in flowers, as some people imagine, is formed in thin cakes, under the scales which case the bee's body. It appears that it is made best while they are quite quiet; and

this is their way of taking rest. While they are clustering, the wax is forming, and when they have hung a number of hours, it may be seen under their scales, which then appear edged with white.

And now, at last, a bee comes out from the crowd, clears about an inch, by driving away the others with its head, and settling in the middle of this space, begins to lay the foundation of a comb, which is a flat piece of wax, composed of a great number of cells. These cells are joined to each other's sides, and placed in a double row, end to end, so that each side of the comb is full of holes, fit for containing eggs or honey. The bee we have just mentioned pulls out the little cakes one by one from its wax-pockets, holds them in a pair of pincers, with which its legs are furnished, and works them about with its tongue, which is as useful as a trowel. When these are fixed to the roof of the hive, it disappears among its companions.

Other bees follow this example, adding their little store of wax until a lump is formed large enough to work upon. The cells are then shaped by another set of labourers; and a third party finish and polish the work, by drawing their mouths, their feet, and their whole bodies over it again and again, until it is quite smooth. Some in the mean time collect food, and bring it to those which are working at the cells, that they may not be hindered. When a labourer is hungry, he bends down his trunk before the bee which is to feed him; this trunk is a moveable mouth, like what you must often have seen in the fly; a few small particles of honey are poured into it by his companion, and he then goes on with his work. Though there are many thousand labourers in a hive, they do not begin in several

places at once, but wait until a single bee has laid the foundation, as I have just described to you. Each bee has only a certain quantity of wax, so they must make it go as far as possible. If the cells were made round, a great deal would be wasted in filling up the spaces between; as you may see yourselves, if you lay a number of marbles together. If they were square, they would not suit the form of the young bees which are to be placed in them.



They are therefore made with six sides, so as to join together exactly, and are very convenient, besides consuming the least wax, and filling the least space possible. Now, the cleverest men might have spent years in discovering this admirable

plan, but taught by God himself the little insect, without study or contrivance, has adopted it from the hour of its creation.

The bee deserves to be held up for a pattern of neatness, as well as of diligence. Nothing can be more nicely fitted and put together, than the cells in a hive. You will always find, that a great deal of waste may be prevented by doing things neatly.

When some rows of cells are finished in the first comb, two other foundation walls are begun, for other combs, one on each side of the first, and exactly the third of an inch apart from it: so that a sort of street is left between, wide enough for two bees to pass each other without difficulty. Several more combs are afterwards built beyond these, but all at the same distance, and all hanging from the roof. As the combs are placed in this manner, that

is *perpendicularly*, or up and down, the cells, whose openings are, as we have seen, on both sides of the combs, must of course lie along instead of standing up. You might imagine, therefore, that the honey would run out, but the bees seem to find no inconvenience in this arrangement, and when the cells are quite full, they are sealed up with a little lid of wax. In order to make their work still firmer, the bees collect a sort of resin or gum, from the buds of trees, and with this they stop up all cracks, as it keeps out the weather better than wax.

I must here mention the way in which the bee carries what it wishes to bring to the hive. You will be ready to smile if I say that it takes little baskets out, in which to fetch home its stores; yet something very like this is really the case. You must have seen its *legs* laden with heaps of a yellow substance, gathered from the flowers; but how do you think this dust is kept from falling off, as the little busy creature flies about? Providence, in forming the bee, has supplied it with the most convenient means of carrying the fruits of its industry. There is a hollow, like a basket, in each of its hind legs, and in these it places what it collects. The foremost feet serve for hands to fill them with, and there is a fringe of long hairs, all round the edge of the baskets, to prevent anything from falling out, even when heaped up quite high. As to honey, this is made of a sweet juice which is sucked by the bees out of flowers, and swallowed, and in their honey-bag it is formed into the sweet substance, which we call by that name. When a bee has filled its bag with honey, it rolls itself round and round in a flower, till the yellow dust sticks to the feathered hairs, with which it is covered. The last joint but

one of each leg is just like a brush, and these little brushes it passes all over its body, till the dust is collected into two heaps, which are kneaded, and pressed into the baskets already mentioned. When a bee thus laden arrives at the hive, others come and help it off with its load. The honey is poured out of its mouth into the cells prepared to contain it, and the yellow dust, or *pollen* as it is called, is kneaded into bee-bread. Each bee goes out several times in the course of the day, and a calculation has been made, that upwards of a pound of this substance is often made by the inhabitants of one hive in that time, and as much as a hundred pounds in the course of the year.

How doth the little busy bee
Improve each shining hour,
And gather honey all the day
From every opening flower !

How skilfully she builds her cell !
How neat she spreads her wax !
And labours hard to store it well
With the sweet food she makes.

In works of labour or of skill,
I would be busy too ;
For Satan finds some mischief still
For idle hands to do.

In books or work, or healthful play.
Let my first years be past.
That I may give for every day
Some good account at last.

When their combs are finished, the bees do not sit down in idleness. Though they are so many in number, each finds enough to do. You have seen how much labour they have in collecting honey and bee-bread; the queen is also to be waited upon;

the young are to be nursed; the hive is to be cleared out; watch is to be kept continually at the door lest any enemy should get in; and new apartments are to be added as the family increases; so that you see the expression "as busy as a bee," is not without a meaning. Besides all this, they have to keep the hive cool by continual fanning. I am not going to tell you that they have fans, exactly like those with which ladies cool themselves; but their wings are made use of just in the same manner. The bees who undertake the office of fanners, are placed in rows as soldiers are; they then join their wings to those of their neighbours, by some little hooks which grow at their edges, and flapping them up and down, make a great deal of wind. There are seldom more than twenty fanners at work at once, and as the same bees would be tired with always performing this fatiguing office, they take it by turns, and relieve one another.

I spoke just now of nursing the young; this is a very laborious part of their employment. The queen begins to lay eggs as soon as the cells are ready, an egg in each cell; and before any honey is collected, the careful bees lay in a store of bee-bread, with which to feed the young ones. In a day or two, a little worm is hatched from each egg, looking like a maggot rolled up in the form of a ring. The bees are very attentive to these poor little helpless things, and run about from one to another, thrusting their heads into the cells, to see whether anything is wanted, and feeding them with bee-bread softened down into a kind of white jelly. After about ten days the worm is full grown, and its kind nurses, knowing that it will require no more food, close up its cell with a waxen door; it

then begins to spin like a caterpillar a soft web, and is changed into a *chrysalis*. Perhaps you do not know what this hard name means; but surely you must sometimes have seen an insect lying enclosed in a hard case like a coffin, quite stiff, and unable to move; it is during this state that it is called a *chrysalis*. Well, after a deep sleep of about ten days, the little creature breaks open its prison, and comes forth a perfect bee. The silken lining is left in the cell, and serves to make it stronger. No sooner is one young bee out of this cradle than another egg is laid on it, so that there are always a number to be nursed. But the patient bees are never tired, and directly they can fly, the young ones take their share of labour, and do not waste their time in play and idleness, as some children are too apt to do. Their example is worthy of imitation, and I trust that you, my young friends, will strive, like them, to be useful as soon as possible. Remember that you can never do enough to show your gratitude to your parents, and to help them, after all the trouble they have bestowed on you. I hope, also, that you will be very kind to any younger children, placed under your care; if you are impatient and cross at the trouble they give, even the bees will put you to shame.

The queen-bee has already been mentioned. She is so called because she governs the hive; she is also the mother of all the young that are born in it. Her subjects are much attached to her, and treat her with the greatest attention. Indeed, *loyalty*, by which is meant dutiful behaviour to our sovereign, is one of the good qualities in which we should do well to imitate them. The conduct of bees when a queen is lost, shows that they have

means of making one another understand. Those which first find out what has happened, run about the hive in a furious manner, touching every companion they meet with their little horns or feelers, which are called *antennæ*. These, in their turn, run about in the same manner, and inform others of the sad event, until the whole hive is in confusion. This agitation lasts four or five hours, after which the bees begin to take measures for repairing their loss. Nothing can be more extraordinary than the way in which they proceed. They build several royal cells, which are much larger than the common ones, and of a different form. Having removed one of the worker-worms into each of these, they feed it with a particular kind of food, and in a few days it grows larger, and at length comes out a queen.

If bees lose their sovereign, and have no cells with young in them to supply her place, they leave off working, and die in a few days. But if, in the midst of their agitation, their lost queen should be restored, they are quiet immediately, for they instantly remember and distinguish her from all others. If a new queen were to be placed in the hive too soon after the loss of the other, no attention would be paid her, and she would be starved to death or smothered in the crowd. But when four-and-twenty hours have passed, and the first grief is over, a stranger queen is well received, and reigns immediately. The bees crowd about her, touch her by turns with their *antennæ*, for so, as I have before said, their little horns are called, give her honey, range themselves round her in a circle, and follow her as a guard when she moves. The way in which they behave, if

another queen comes into the hive while their own is in it, deserves to be mentioned. The entrance being guarded night and day by sentinels, nothing can go in or out unperceived. The moment a stranger-queen is seen to enter, she is surrounded by a circle of bees, so that she cannot move; and another set of workers flock around the original queen, in the same manner. This is done to oblige them to fight. If they try to get away, they are stopped, but if either shows the least inclination to move towards the other, the workers make way; a desperate battle ensues between them, and one is stung to death. If the conduct of our little favourites upon this occasion, and some others now to be mentioned, does not appear in quite so pleasing a light as other parts of their behaviour, we must remember that it is their nature to allow of only one queen: still we must be sorry to find them using such a cruel method of keeping order in their hive. When we see cruelty and other bad qualities among animals, we may ourselves take warning by them: when we see them raging, and destroying one another, we may learn to avoid those fierce and bad passions, which in rational beings are so displeasing to God.

The offspring of one queen alone is too numerous for a hive to hold. She will sometimes lay, in one season, sixty or seventy thousand eggs, so you may easily suppose, that it would never do to have more queens than one. Yet as no swarms would leave their home to seek another, without a sovereign to lead them, some of the eggs laid every year turn to young queens, the rest producing drones and workers. There are some drones in every hive: they are rather larger than the working bees, and do not col-

lect honey, or help to build the cells, but are turned out of the hive before winter, that they may not eat what the industrious have collected. Idle people are often compared to drones.

It is the nature of queen-bees to be very jealous of one another, and this is an instinct given them, to prevent more than one remaining in the hive. When the young queens are ready to leave their cradles, and to become perfect insects, their mother grows furious, tears open the cells, and stings them to death, before they are capable of self-defence. The guards, which are always placed about them, make way, and allow her to do what she pleases. But as the royal cells are much thicker than those of common bees, she is tired after opening one or two, and gnaws in vain at the third. Still agitated at the sight, she runs about the hive in a fury. By little blows with her antennæ, she communicates the same feeling to the workers, and they run about in all directions, until they are so heated by their violent exercise, and make the air of the hive so hot that they can stay in it no longer. A great number then rush out with their old queen, to seek another home. After she is gone, the bees watch the royal cells, and as soon as a young queen comes forth she begins to attack the others which are not yet full grown. But the guards do not allow her to kill any of them, as her mother did. When she is resisted she stands upright, and utters a shrill, piercing cry. On hearing this the bees hang down their heads, and seem quite stupified; but as soon as she begins again to gnaw the wax she is silent, and they recover themselves, and drive her away. After running in vain from one to another, and meeting with the same treatment, she rages about the hive, until

with a number of workers she quits it, as the former queen did. The same thing happens, again and again, with other young queens as they come forth, until several swarms have issued from the hive.

The bees on all other occasions are most respectful to their monarch, but they know that several leaders are necessary, and that too many must not be destroyed. When only one queen is wanted, they encourage them to fight, as we have already seen; but it sometimes happens in the swarming season, that three or four are ready to leave their cells at the same time, before the birth of a sufficient number of workers. In this case, the bees keep them prisoners for some days, and shut up their cells with wax, as fast as the young queens try to bite their way out. When they call for food, and thrust their trunk through a hole, made just large enough for the purpose, a nurse-bee, standing by, immediately gives them some honey. When fresh swarms are ready to go with them, they are let out, and thus new colonies are formed, and we are supplied with plenty of these useful little creatures.

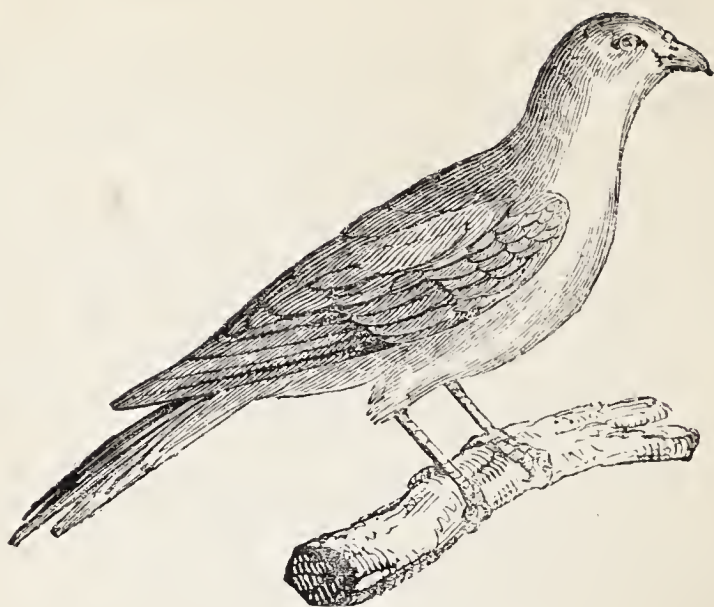
Now that we have sugar in such abundance, honey is not so much wanted as before the discovery of the East and West Indies, where the sugar-cane grows. Honey was then the only thing that could be used instead of sugar. It is often spoken of in the Bible as an article of food, and among things sent as presents, (Gen. xliii. 11; 1 Kings xiv. 3.) Canaan is described as "a land flowing with milk and honey," to show how plentiful it was. St. John the Baptist is said to have lived upon "locusts and wild honey;" and a piece of honeycomb formed part of the meal set before our blessed Lord, when, after his resurrection, he ate with his disciples.

You must not imagine, however, that bees were kept by the Jews, as they are by us. In Palestine, or the Holy Land, which is the country where they lived, *wild* bees are very numerous, and are generally found in hollow trees, or in the clefts of the rocks. You may remember how frequently mention is made in the Bible of "honey out of the rock," (Deut. xxxii. 13; Psalm lxxxii. 16, &c.) and in the present day their nests may be seen so situated, hanging in innumerable clusters.

The wild bees, in some parts of America, do not store up their honey in cells, but in wax-bags, about the size and shape of a pigeon's egg; and these bags, or bladders, are hung round the sides of the nest. Travellers describe some which are of a deep violet colour, and form clusters almost like bunches of grapes. Within the nests are cells for the young, like those of our hive-bees.

Other bees build upon trees, which may be seen loaded with heavy shells of clay, like martins' nests, and as much as two feet wide; when these are broken, they are found to be divided into cells, and full of honey. Others again, which are found in Mexico, and make the finest honey in the world, form their nests in the shape and size of a sugar-loaf; they are hung from trees, and contain many more bees even than our hives.

In all these countries, the sweet stores laid up by the bee are eagerly sought for, and in some parts of Africa men meet with a most singular and useful assistant in discovering them. There is a bird called the *honey-guide*, rather larger than a common sparrow, which, far from being alarmed at the presence of a human being, seems to court his acquaintance.



THE HONEY-GUIDE.

In the morning and evening, which are its meal-times, it flutters about from tree to tree, repeatedly uttering the cry of *cherr, cherr, cherr*; a note of invitation, well known to all who live in those countries. A person invited by one of these birds seldom refuses to follow, until it stops, which it always does, at some hollow tree, containing a bee's nest, well stored with wax and honey. The bird is probably led thus to seek assistance, from the knowledge that it is unable to stand the attack of a number of bees, or to break into their nest by itself. When arrived at the spot, it hovers over it, and then, alighting on a neighbouring tree or bush, sits in silent expectation of its share of the spoil, which is that part of the comb containing the brood; this is always carefully left for it, and indeed the ingenious bird well deserves to be remembered.

The Americans, who have not the honey-guide to help them, adopt several methods of tracing bees to

their home. One of the most common is, to place some bee-bread, in order to tempt them, on a flat board, or tile, and draw a circle round it with white paint. The bee is always accustomed to settle upon the *edge* of anything flat, so she must travel through the paint to get at the bee-bread. When she flies away, the white on her body enables the observer to trace her flight, and her course is marked down with a pocket compass. The same thing is done at another spot, some distance from the first, and by comparing the direction of the two lines, the situation of the nest is easily found, as it must be at the point where, if continued, they would meet.



THE HONEY-RATEL.

The plan of watching bees home, in order to rob their dwelling, is not adopted by human beings alone. An animal, called the *honey-ratel*, will sit and hold one of his paws before his eyes, about the time of sunset, in order to get a distinct view of the objects of his pursuit, and when he sees any bees flying, he knows that, at that hour, they are returning home, and follows them.

The enemies of bees are very numerous: some, such as wasps and hornets, attack them singly, during their wanderings in search of flowers; but there are

several kinds of moths, which try to gain admittance into the hive, and when there, do infinite mischief. The utmost anxiety is therefore shown by the inhabitants in guarding the entrance. At night, the time when moths fly about, the sentinels are particularly on the watch, and if you observe them by moonlight, you may see them pacing to and fro, and turning their antennæ in every direction. Knowing that bees cannot see without a strong light, the moth seeks to glide in between the guards, taking the greatest care not to touch them. If the approach of the enemy is discovered, they utter a loud hum, and more workers rush out from within, in overpowering numbers, armed with their fatal stings. These moths seem very weak and harmless creatures, yet should one of them succeed in getting in, the bees have no slight cause to regret it. Sometimes one enters, notwithstanding all their care, and they may be seen chasing it all over the hive. The creature, however, runs faster than its pursuers, and, after much twisting and turning, gets at last into a corner, and is out of their reach. Here it lays its eggs, which, indeed, was the object for which it ran all this danger; wax being the food proper for the young grubs, which are to proceed from the eggs. As soon as they are hatched, each grub forms a winding tube or pipe in the wax, sometimes eighteen inches long. These pipes are lined with silk, and though bees can cut paper, or even wood, they are unable to pierce them, or to destroy their enemies, who are thus secure in the midst of a thousand stings. The grubs bore through the comb in every direction; no part is safe from their ravages, and the mischief done by them is sometimes so great, that the bees see all the fruits of their art and industry destroyed, and are obliged to quit the hive.



THE DEATH'S-HEAD MOTH.'

A very large moth, which from the mark on its head, is called the *death's-head moth*, makes its way into bee-hives, but with a different purpose. This creature has the power of emitting a remarkable sound, supposed to have an effect upon the bees, like that made by their queen, which, as we have before said, strikes them motionless: and thus it is enabled to steal their honey. The only plan of defence, therefore, is to render it impossible for the enemy to enter. At the season when they are in danger from this moth, the bees often block up the door-way with a thick wall made of wax and resin, and pierced with one or two openings, large enough only for themselves to enter; or they build a number of little walls one behind another, by which the same purpose is answered.

Sometimes an intruder of a different kind makes its appearance; a slug will creep in, and stick so fast, that the bees, with all their skill, cannot get rid of it. But they are at no loss how to remedy this evil: having stung it to death, they cover it all

over with the resin we have mentioned, and thus embalm it, so that no unwholesome smell from it can inconvenience them. Should a snail pay them a visit, though his hard covering defends him from their stings, he is not allowed to depart in safety, for they lay the same substance all round the mouth of the shell, and so fix him down, without the power of ever moving from the spot, and of course he perishes. I could tell you many more interesting particulars respecting these insects, but it is time to say something about others, or there will be no room for them in my little book.

Before we quite take leave of the hive-bees, however, let us pause for a moment, to reflect upon the lessons of wisdom and virtue which they teach. With what order and regularity is all their work done; how neat and clean their abode is kept; how wisely they lay by in the summer, for their future wants; how patient and diligent they are; how kind and tender to the young; how dutiful and obedient to their queen; how ready to assist one another, never selfishly thinking of themselves, but doing everything for the general good! And what comfort and abundance are the result! Let not *us* who are blessed with reason, act less wisely or less well; with the Holy Scriptures for our guide, and God's grace to assist us, far more will be looked for and required from us. Nor, while we admire the wonders which the study of nature unfolds to our view, let us forget the Almighty being from whom they proceed. When we see any beautiful or curious thing made by man, do we not admire the skill of the maker? God's works not only far excel ours, but they have this grand distinction, that they are formed *out of nothing*. Their boundless variety

affords another subject for our wonder and adoration. Innumerable as they are, these millions of living creatures are all known to and supported by God. "His tender mercies are over all his works:" as the very hairs of our head are numbered, and not a sparrow falls to the ground but by His will, so even the life of the smallest insect is sustained by his power alone; and the hand which formed, supports and preserves it from harm. These contemplations are very profitable, though our understandings are much too weak fully to comprehend them. What an idea should they give us of the greatness of God! what confidence in his protection, should we his nobler creatures feel, when we see that the meanest insect is not beneath his care!

THE HUMBLE-BEE.



HUMBLE-BEE.



MASON-BEE.

We will now turn our attention to the *carder* or *humble-bee*; rather a clumsy-looking creature, with which most people are acquainted. Whether it acquired its name from this circumstance or not, it is very justly called the *humble-bee*; its habitation being a mere village, in comparison with the populous city we have just been describing. The nest of this kind of bee is often found in hay-fields and

hedges. It is made of moss, and is round like a ball; containing sometimes only twenty bees, and seldom above two or three hundred.

The humble-bees always choose a place to build in, where there is plenty of moss; for they could not attempt to fetch it from a distance. The way in which they collect this material is very curious. A bee settles on a tuft of moss, with its head turned away from the place, where the nest is to be. Having torn some little branches off the plant, and wound or carded them into a small bundle, with its teeth and foremost legs, it passes them on to the middle pair, and these convey them to the hindermost. With this third pair the bee holds the bundle of moss out as far as it can; another bee, placed behind, receives and passes it on, in the same manner to the next; and so by placing themselves in a row, and working together, these insects save much time and trouble, for they cannot fly with a load like the lighter hive-bee. When one alone has to build a nest, as will sometimes happen, its only way of bringing the materials together is to push them, backwards along the ground, which is very tedious and fatiguing.

If you watch a nest, you will soon see one of the inhabitants burying itself in a mossy hole, at some distance. This is the entrance of a covered passage, about a foot in length, leading to the inside. The nest is lined with a kind of coarse wax, to support the moss; it contains a few combs, not regularly formed like those of the hive-bee, but very clumsily shaped. The eggs are not placed each in a separate cell, but as many as thirty are sometimes found together. A quantity of bee-bread is placed, ready for the young grubs; and when they have eaten it,

each spins itself a cell, from which it has no means of getting out. The old bees, however, know the exact time when to gnaw off the covering, and set the insect free. These cells are afterwards used to hold honey, and as many as forty are sometimes filled in a day. The humble-bee is more skilful than the hive-bee in collecting honey. In some flowers it is concealed; the humble-bee however is sure to find it out, and making a hole in the nectary, or honey-cup, easily draws it off.

And here I must tell you a curious story, to show how good-natured and generous a disposition this bee possesses. In a time of scarcity a party of hive-bees once took possession of a humble-bee's nest, and stole all their honey. The original inhabitants however still went out to collect a fresh supply, and on their return home every day, the others stroked them gently with their tongues, and held out their trunks to beg for food, but never attempted to take it by force, and these good-natured creatures gave all that they had got to their unwelcome visitors, though they themselves had been used so ill. Another instance will serve to show how much inconvenience these patient insects endure, in nursing the young, and how little they think of their own comfort. Heat is necessary to keep the tender little things alive, and the bees brood over them, as birds do over their nest. Once a very clever man, who found out many of the things I have told you, wishing to watch them, put twelve humble bees under a glass-case, and gave them a piece of comb with some young in it. They were sadly disquieted, for the piece was so uneven that it would not rest firmly, and they could not cluster and warm their little nurslings. Their affection however suggested a plan.

Some of them mounted on the comb, and by placing their hindermost feet on its edge, and their foremost on the table, made the comb steady enough for their companions to cluster on it. For three days they went on in this uncomfortable position, relieving one another by turns, until wax enough was prepared to build some little pillars. These pillars, however, got out of their places, and they returned to the first plan, until at last the gentleman I have mentioned, took pity upon them, and fixed the comb more firmly than they could do themselves.

These insects, when tormented by a kind of mite, which is often found upon them in great numbers, have recourse to a very singular contrivance. A humble-bee will go to an ant-hill under such circumstances, and there kick and scratch, and make a disturbance, until the ants come out to see what is the matter. Before they attempt to drive their noisy visitor away, the ants seize upon these mites, and carry them off as a prize, and the bee, as soon as it is set free from its enemies, flies away contented.

SOLITARY-BEES.

Besides bees of a social nature, such, I mean, as live together like a family, there are several other kinds which live alone, and form a nest by their solitary labour.

The *mason-bee* is one of these: she scoops out little pieces of clay, about the size of a pea, and having kneaded and moistened them with her mouth, carries them to a place which she has chosen for the purpose. This is generally some hole in an old wall, where the mortar has fallen out. Several hundreds of little clay-balls are required to form her nest, so that she

must work many hours a day to finish it. Besides, she has the trouble of lining and polishing the cells, that the hard earth may not hurt her tender offspring. For the purpose of concealment, she also raises a little heap of clay all round, which looks only like a lump of mud stuck to the wall. If you watch one of these busy insects collecting clay, you will find that she does not at all disturb herself, or mind your looking on; but if you follow her, and go near her nest, she will fly a different way, or alight elsewhere, as if to rest herself, or seem to examine other cracks in the wall at some distance, lest the real spot where she builds should be discovered; and as soon as you are out of sight she will fly back eagerly to her work.

The little cells she makes, before they are closed, are just the shape and size of the thimble used for needlework. When one is ready, the careful parent lays an egg in it, and collects from flowers some of the pollen, of which we have already spoken, for the young bee to feed upon. The top is then carefully closed, and the grub having gone through the usual changes, first into the form of the chrysalis, and then into that of the perfect bee, bites its way through the hard and dry wall which imprisons it, without the mother's aid. From four to eight of these cells are contained in each nest, and the spaces between them are filled up with clay.

These creatures have many enemies, but the worst of all is the ant. If one by chance discovers the hidden treasure, the whole tribe are presently informed of it, and advance in long files towards the spot. In vain the poor bee endeavours to resist, she is at last overpowered by numbers; and unable to drive away the advancing host, she gives up in despair, and abandons the produce of her labour to the hungry foe.

CARPENTER-BEE'S NEST.



There are other kinds, called *carpenter-bees*, because they work in wood. Nor are these less interesting than the little masons, whom we have just been describing. One of the most remarkable is distinguished by beautiful wings of a deep violet colour, but it is not found in this country. In the beginning of spring, after carefully looking about, the carpenter-bee fixes upon some old post, or decayed piece of wood, suited to her purpose, and bores a hole twelve or fourteen inches deep, and larger than your finger. This is a very hard task for such a little labourer, and she is several days about it, having no tools but her two strong teeth. At last it is finished, and is as smooth as if chiselled by a joiner, so that it wants no lining. But each of her young ones will require a separate apartment, and how, you will ask, is she to divide this long and narrow pipe into a number of cells? Of what can she make the floors and ceilings? She has no pattern to copy: she has learned nothing by practice; for she makes a nest but once in her life; but the Great Maker of all things has impressed a plan upon her mind, which she follows without any other assistance. This, and similar faculties bestowed upon the inferior animals instead of reason, we call *instinct*. By this wonderful property, though unable to think as we do, they know exactly what to do, and the best way of doing it.

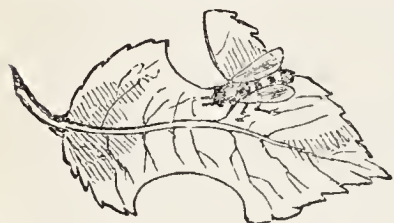
The little heap of wood-dust which has fallen on the ground, as she bored the pipe, and a gummy fluid in her own mouth, supply all she wants. Having deposited an egg at the bottom, together

with the exact quantity of pollen which her offspring will require for food, she shuts it in thus:—First, some of these little pieces of saw-dust are glued together, into the form of a ring, round the inside walls of her house. Within this ring she fixes another, and so she goes on, until a round plate is formed, very hard, and about the thickness of a half-penny. The circles on this plate are very much like those seen in the branch of a tree, when it is cut through. As the direction in which the hole is bored is straight up and down, this serves for a ceiling to one cell and a floor to the next. The bee makes one above another until the whole pipe is filled. The entrance is then stopped up, to keep out any enemy who might come to devour the young, or take possession of the nest.

If you have attended to what I have been saying, you will see, that it must take some days to make these cells, and to collect food with which to fill them. The eggs first laid, therefore, will be hatched, and have produced perfect bees, long before the last. And what do you think will become of the elder insects, in the lowest cells? How can they gnaw through ten or eleven hard coverings? And if they could do so, would not all the young bees in the upper cells thus be disturbed, before their time, and destroyed? Or do you think the elder insects will wait patiently in their prison till the rest have made their way out? I will tell you how the careful parent contrives for them. She makes an opening, in the side of the pipe, at the lower end, and so forms a back door, by which they may escape, one by one, according to their ages, each having only to gnaw through its own cell, and then finding the way open which the others have made through theirs. It is very wonderful, that in turning into a chrysalis,

each grub places itself with its head downwards, so that it is sure to break open the cell at the right end.

I must now tell you about the *upholsterer-bees*, who line their nest with elegant tapestry, made of leaves or flowers. This is an easier task, in point of



labour, than that of the masons and carpenters, but it requires no less skill. One of these bees, called the *leaf-cutter*, makes a hole in the ground, or in wood, or in some old wall. It is six

or eight inches deep, and in a different direction from that just described, for it lies along, and is like a little ditch, instead of being perpendicular. Her way of dividing it into cells, is also quite different from any that we have yet mentioned. Instead of clay, or wood, she makes use of pieces of green leaves, generally those of the rose-tree. These are not torn roughly off. With her teeth she cuts out little circular pieces, much more neatly than you could do with a pair of seissors. Beginning near the stalk, and keeping her feet fixed, she turns so as to cut in a regular curved line, without needing a ruler or compasses to shape it. When the piece hangs by the last fibre, lest her weight should tear it, she balances herself upon her little wings, and the moment it is quite cut through, and parted from the leaf, she flies off in triumph to her apartment, and without nails or hammer, needles or thread, like a clever little upholsterer, puts up these pretty green hangings. Large pieces of leaf are first placed, as a lining to the whole tube, and laid several times double, that the earth may not fall in. These leaves do not

require any fixing, as they press against the sides, in endeavouring to return to their natural flat position. By folding the pieces over one another the end is rounded, and thus the first cell is formed in the shape of a thimble; an egg is then placed in it, and it is filled with some beautiful rose-coloured honey, collected from thistles. Lest this should run out, as the cell lies on its side, it is corked up with several circular portions of leaf, exactly fitted to its mouth, but curving inwards, so that a hollow is left to receive the end of the next cell. How wonderful it is, that without any implement for measuring, our little bee should always cut her materials to the right size. and not make a single mistake! No workman could do this without the practice of many years, but she does it at once; so far are human art and reason excelled by the teaching of the Almighty! A second cell is placed, with its round end fitted into the mouth of the first, and several follow in the same manner, till the whole is like a set of little thimbles one within another, sometimes to the number of six or eight.



LEAFCUTTER-BEE'S NEST.

One of the upholsterer-bees shows a much less sober taste. She chooses the brilliant scarlet leaves of the field-poppy, from which she cuts oval-shaped pieces, and seizing them between her legs, carries them to a little chamber, which she has dug in the



UPHOLSTERER-BEE'S NEST.

form of a pear, about three or four inches deep. When the piece is too large to fit the place intended, she cuts it smaller, and carries the shreds away. If *you* were to cut a poppy-leaf, you would find it very difficult to keep it from curling up, but *she* knows how to lay it quite smoothly. This little room is rendered warm and soft, with three or four folds of scarlet hangings, and makes a most beautiful nursery for her young. Having put in plenty of honey, she draws the curtains round; and though it seems a pity to hide it, she covers all her work up with earth, knowing that it would not be safe to let it be seen, lest it should attract thieves, who would murder her little ones. Whether she really is sensible of the beauty of these flowers, and chooses them for this reason, we cannot tell; but do you not think it wonderful, that every bee of the same kind should use the same thing to make its nest? It only builds once in its life, and dies before the young ones become perfect insects, so that *they* cannot be taught by their parent, and yet they do exactly the same. *We* learn by practice, and cannot build a house or make anything until we have tried many times; and yet the gift of *reason*, which is bestowed on man, is far better than the blind *instinct* as I have told you it is called, given to the inferior creatures. "He that teacheth man knowledge," not only enables *us*, by the diligent use of this reason, to find out ways of providing for our wants; but also to invent endless arts and improvements, of which *they* are incapable. The chief particular, however, in which *our* faculties so far excel *theirs*, is that they render us capable of knowing our Great Maker, of loving, and of serving Him!

WASPS.

PERHAPS my young reader does not feel inclined to take so much interest in the proceedings of wasps, as in those of the industrious bee, to whom he is indebted for such sweet honey. He may remember the pain of being stung, or he may look upon the wasp as an ill-natured, spiteful creature, which is always buzzing about, and disturbing him at his meals; or he may regret some fine fruit, which he was daily watching in his parent's little garden, and hoping to taste when it should be ripe, had not a thievish wasp eaten it up. I cannot say that this is so pleasing an insect as the bee, but it has some good qualities, and is not without its use. It seldom stings unless it is hurt; and if children would sit still, when a wasp is inclined to settle on them, instead of fighting with it, and making it angry, they would often escape being stung. You will be less provoked at the boldness of wasps in robbing, when you learn, that they are not influenced, as it might appear, by greediness; and that your fruit was stolen to support the tender young of the nest, which would have died of hunger, without this supply. A reason of this kind would not be any excuse for *our* stealing, but we must remember, that the great table of nature is spread for all God's creatures, as well as for ourselves, and that He has taught them to take the food proper for them, wherever they can find it. Then let us not grudge them the little they consume, while so much is left for us; but let us lift up our hearts in gratitude to Him who "fillet all things living with plenteousness." We must however keep them within due

bounds. The mischief they would do, if they were suffered to multiply, renders it necessary, sometimes, to put them to death, and to destroy their nests, but I hope, when you kill them, you always do it, so as to cause them as little pain as possible; and that you never take pleasure in watching the sufferings of the poor little animals, as they struggle in the agonies of death. Their lives are very short, they only live one summer to enjoy themselves, and when we are obliged to render the existence of any of God's creatures still shorter, we should do it with pity and concern, and only in self-defence.

Though not so careful as the bee in laying up a store for the winter, the wasp is quite as ingenious in building its house, and indeed has often a much harder task to perform, as at first *one* has to do all the work alone. Unlike the queen-bee, who sets out attended by thousands of industrious workers, the female wasp lays the foundation of her city without assistance. I have just told you that wasps live only one summer; a few, however, perhaps ten or twelve, out of twenty or thirty thousand in a nest, live through the winter in a torpid state like dormice, without eating. When they awake from this long sleep, it must be a mournful sight to behold all their companions lying dead around them, having perished with cold and hunger. No wonder then that they leave this sad grave of their friends, and never return to it, but prefer the trouble of making a new nest. You may see wasps in the spring, peeping and prying into every hole in a bank, to find a place where a mouse has burrowed, or some other hole, which may serve for a beginning. Each of these wasps becomes the mother of a new swarm, but she has a great deal of hard work to do, before

she can get a place ready for her young family. She first makes a long, and generally a winding passage, about an inch in width, and one or two feet in length. This leads to a chamber as wide as the passage is long, and when this chamber is hollowed out, she has to line it firmly, that the earth may not fall in, and to build the cells; so you see she is industrious at least. But the wasp has no wax as bees have, and how is she to make her cells without it? You will be surprised to hear that she uses paper instead, and makes it herself too. It is strange that men should never have learned from the wasp how to manufacture this useful article. From the beginning of the world, she has practised this art under the guidance of instinct; but men went on for nearly five thousand years without paper, though they sadly wanted something better than the leaves of plants, the bark of trees, or the skins of beasts to write upon.

The following is the way in which our queen-wasp makes the paper we allude to:—Having gnawed a bundle of fibres out of a piece of wood, she carries them off, moistens them with a gummy liquid, which her mouth supplies, and kneads them into a sort of paste. With this she first lines the roof, spreading out the little ball of paste by means of her tongue and feet, until it is almost as thin as silver-paper. A single sheet of this would not be strong enough; fifteen or sixteen layers are therefore placed, with spaces between, till the walls become nearly two inches thick, and look like oyster-shells, laid one over another. The wasp does not, like the bee, build the combs perpendicularly, that is, up and down, but across, like a hanging floor; and she supports them with rods, about an inch long reaching from the roof. These are made of the

same material with the walls, and so are the cells, which are as neatly shaped, and of much the same size, as those in a bee-hive. It is wonderful how one little creature can perform all this, which appears almost to be as great a labour, in proportion to her size, as if one man were to build a town. When at last the queen-wasp has finished a few cells, and laid her eggs in them, she is obliged to leave off building, and to collect food for the young grubs, which will soon be hatched. In a few weeks these become perfect wasps, and the poor mother, after she has laboured so hard, has now, as she deserves, some assistance from her children, who work with her, make new layers of cells for the increasing family, feed them, and attend to them in their turn. By the end of the summer there are thirteen or fourteen of these layers, containing altogether as many as sixteen thousand cells. The cells, when left by one young wasp, serve for a cradle to a second, and a third; one nest therefore may produce above three hundred thousand wasps. But after all the trouble it has cost, it lasts only one year, as you have already been told.

Some wasps of a different kind, called *tree-wasps*, do not dig into the ground, but hang their nest from the end of a branch. They generally choose a fir-tree, which, never losing its leaves, serves to keep off the sun and rain. In some foreign countries, these wasps make an outside covering for their nest, which is as strong, and white, and smooth, as card, so that the rain cannot penetrate it. These curious habitations are in the form of a purse, and the entrance is by a hole underneath.

Wasps are not inferior to bees, in kindness and attention to the young. It is amusing to see how

active they are in running from cell to cell, putting their heads into the cells of the very young grubs; and giving them a drop of sweet juice. Those that are older, are fed with more solid food, and they thrust their heads out eagerly, and seem to ask for it, like young birds. Wasps not only eat fruit, and all sweet things, but they devour bees, flies, and even meat. The blue-bottle fly is considered by them as delicate food, and they are very useful in destroying it; indeed, when there is a scarcity of wasps, you will generally find, that flies of all kinds are very numerous and troublesome. The wasp is also particularly fond of eating bees; it will watch for hours at the hive-door, seize an unfortunate inhabitant, just about to enter, and in a moment bite off its head and wings, that it may not be too heavy, for they are dry and unfit to eat, and carry the body home. As soon as a wasp thus laden arrives, those who have been busy within, crowd round for a share of the prey, which is divided among them and the larger grubs.

The affection of wasps for their home and their young is quite remarkable; even if their nest be broken to pieces, they will linger for whole days about the spot, and follow wherever the combs may be carried. Yet, notwithstanding all the care and love they show at other times, on the approach of winter, they drag the grubs from their cells and kill them, strewing the ground all round the nest with dead bodies. You will think this strangely cruel, but wasps can lay by no stores for the winter, and the young would die in all the agonies of hunger, when no more food could be procured. The merciful Author of their being, that they may suffer as little as possible, has given wasps this singular

instinct, and taught those which have lived their appointed time, to put the others to a short and easy death, before they die themselves. Were a whole nest of wasps to live through the winter, they would multiply so fast, that flies, bees, and all the creatures they feed upon, would soon be destroyed, and they would become a dreadful torment to us.

There are also solitary wasps, whose habits are not less curious. The *mason-wasp* cuts a hole in brick-work, biting out pieces about the size of a mustard-seed; and as a heap of little broken crumbs of brick might lead her enemy, the cuckoo-fly, to the place, she takes great care to convey them away. A wasp was once seen to drop one of these little pieces upon the ground, but she looked about until she found it, and then carried it off like the rest. The hole is only just large enough to admit her, so it is not very easy to carry anything out, and how do you think the insect manages? She seizes the piece of brick firmly in her jaws, and instead of turning round, comes out of the hole backwards. I told you the mason-wasp was afraid of the cuckoo-fly, a mischievous visitor, who, like the bird from which it is named, lays its eggs in a nest which does not belong to it. She has good reason to be afraid; for the fly-grub, when hatched, kills the young wasp-grub and eats it up.

Another *mason-wasp* has a very curious mode of building a house for her offspring. She bores two or three inches deep into a sand-bank; choosing in general a place as hard as stone, but she has the means of softening it, by a drop of fluid from her mouth, after which she is able to hew it with her jaws, which are formed like a little double pickaxe. When some of the sand is dug out, she kneads it

into a little ball, and fastens it outside the entrance. As she goes on digging below, she continues to form these little balls, and to place them round the opening, so as to raise a round tower. She works so hard, that in an hour she has been seen to dig a gallery as long as her body, and to build a tower of the same height. The latter is probably intended to shelter the insect from the heat of the sun, as she works, and to keep out the mischievous cuckoo-fly, who may be seen prying in, and then flying away, afraid to venture into this long and dark passage, lest the wasp should be at home. These young grubs do not, like those of bees, live upon the dust of flowers, but their careful mother lays in a store of such food as she knows will suit them. And here is another instance of the wonderful faculty by which the parent knows how to provide for the wants of her offspring. She collects a number of caterpillars, of a green kind, without feet, and packs them one upon another, in a spiral column, like a cork-screw, and in such a manner that they cannot move, though they remain alive. Had they been crowded together, the little worm might have nibbled and killed them all, instead of consuming one at a time; and so his food would have become putrid, and have been spoiled. It is worthy of observation too, that the mother takes care to collect only such caterpillars as are full grown, and can live the longest without eating. Had she chosen them at an earlier age, they must have died of hunger, before her little



MASON-WASP'S NEST.

nursling was ready for them, as the wasp-grub requires food more than a fortnight, until it passes into its second state as a chrysalis.

The entrance to the nest is just wide enough to admit her, and she could not get in with a caterpillar in her mouth, so she is obliged to unroll it, and carry it straight underneath her body. Placing it at the bottom of the cell over the egg, she takes care to press it down, the creature of itself, immediately rolling into the form of a ring. The mother knows exactly the number which will be wanted, and generally supplies her greedy little wasp with as many as twelve caterpillars, much larger than himself; she then takes down the tower, and having closed up the mouth of the cell, proceeds to make several others in the same manner.

There is another kind of *mason-wasp*, which, instead of putting in a stock of food at once, imprisons only one living insect at a time, and when that is eaten, opens the nest, and introduces another. A wasp of this kind has been seen dragging a caterpillar, three times as big as herself; and gliding with this heavy burden in the most active manner, over the grass and weeds which grew in the path. When she reached her nest, she laid the caterpillar down and removed the lumps of earth which stopped up the entrance. Having gone into the hole to see that all was safe, she came back to fetch the caterpillar, and pulled it in. She then returned, and rolled pieces of earth into the hole, scratching the dust in with her fore feet, and treading it down. This wasp also flew once or twice to a fir-tree, and having filled the hole up quite even with the ground, so that it could not be seen, she took two fir-leaves and placed them near, as if to mark the place.

How many interesting réflexions do these singular facts excite in our minds! How extraordinary is it, that the parent insect should thus know the exact time when her eggs will be hatched into grubs, and how long the provision she has laid up will support them! How surprising, that she should recollect the exact place where her nest is, and be able to fly to it without mistake, after all her wanderings! Who can think of these faculties bestowed upon so small a creature, without adoring Him, who is “wonderful in counsel, and excellent in working!”

GALL INSECTS.

IN the beginning of this little book, I spoke of oak-apples, and the moss-like tufts upon the wild briar, as the work of insects. These, and various other *blights*, as they are called, form the favourite playthings of many children, during their early years. What child, who has lived in the country, has not shouted with joy at finding a green briar-ball, beautifully fringed with red, or as you perhaps would call it, a “*robin’s-cushion*?” Who that has found one, forgetting his search after birds’ nests, blackberries, or nuts, has not ventured his hand into the thorny bush to gather it? What village boy has not tried again and again, with a hooked stick, to reach a fine oak-apple, and thought how beautiful it would look covered with leaf-gold, and after jumping many times in vain, carried off the prize at last, to be placed in his own hat, or in that of some friend, on the day kept in memory of King Charles’s Restoration?

Perhaps, you yourselves may recollect, with pleasure, hours spent under some shady oak, almost every branch of which presented you with a fresh treasure. From the stalks which had borne blossoms

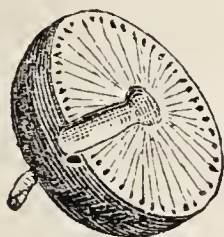
hung what looked like little branches of currants. The ends of the twigs furnished little artichokes. On one leaf were found small green and smooth balls, tinged with red; these you perhaps pulled off, and placed in an acorn cup for a basket of apples. On another leaf grew what resembled mushrooms, and a third was covered with little flat copper-coloured substances, not unlike money, and so perhaps you called them, as many children have done before you, and played with your companions at buying and selling these fruits and vegetables; or amused yourselves by stringing them, like beads, upon a thread.



GALLS ON OAK.

In the autumn, too, you may remember watching the leaves of a poplar tree, as they came fluttering

down with every breath of wind ; and trying how many you could collect, with their stalks curiously swollen into the shape of a pear, instead of being in their proper slender form.



GALL MAGNIFIED.



GALL INSECT MUCH MAGNIFIED.

It is to an insect called the *gall-fly*, that you owe all this amusement, and it is to make a nest for her young, that she forms these wonderful structures. She has not, like the bee and the wasp, to bring materials from a distance, and then to knead, and prepare, and place them ; but with a touch the wonderful dwelling springs up, in all its beauty. She is furnished with a long and curious sting, like a corkscrew, with which she pierces the plant, and pours into it a drop of poisonous juice ; this makes the parts around swell in the manner we have mentioned, and a spacious chamber is thus formed, in which the eggs are hatched, and the young are kept warm, and nourished with the juices of the plant, till they have passed into their winged state, and eat their way through into the open air.

These insects are not all of one kind, and their abodes are to be found in many various forms, besides those we have mentioned ; and on every part of a plant, whether it be branch, root, leaf, or bud. Nor are they confined to trees ; on thistles, on the ground-ivy, and on that pretty little blue flower, the

Germander, they are very frequently to be met with, as well as on many common plants. Some which are found in foreign countries are collected in great quantities for sale. A gall-nut, gathered from a kind of oak, is used in making ink, and you need not be told how valuable this is, in enabling us to write letters to our absent friends, and to hear of their health and welfare, be their distance from us ever so great. Those which are the best for making ink, are called blue galls; they are gathered before the fly has come out. Those which have been overlooked in the first gathering, and from which the perfect insects have escaped, are called white galls, and are by no means so good.

Gum-lac is another valuable article, produced by this tribe of insects; it is composed of cells, like honey-combs, of a deep red colour, and is found in such abundance on some trees in India, that their upper branches appear as if covered with blood. Of this substance sealing-wax is made; it is also used in painting and dyeing scarlet, and the natives form necklaces, and various ornaments of it. I dare say you had no idea that the gall insects were so useful, until you heard this.

THE BURYING BEETLE.



THE insect called, on account of its habits, by this name, is not uncommon in England. It provides for the safety of its eggs, and the support of its young, in a most extraordinary way; quite differently from any other creature which we have

as yet mentioned. The task which it performs is so laborious, that it seems to deserve a place here, though it does not actually build or raise any structure. It had been observed that dead moles, when laid upon the ground, generally disappeared in two or three days, and sometimes even within twelve hours. In order to find out how this happened, a mole was laid in a garden, and the place marked. At the end of three days it was gone, and upon digging where it had been placed, it was found buried three inches deep; and under it were four beetles. To be quite sure that these creatures were the real cause of its disappearance, four of the same kind were put into a glass vessel, half filled with earth, and covered over so that they could not get out. Two frogs were also laid upon the earth: one of these frogs was buried in the course of twelve hours, by two of the beetles. The other two ran about the whole day, as if measuring the size of the remaining corpse, and at last they went to work and buried it. A linnet was then put in; they began by pushing out the earth from under it, so as to form a hole for its reception, and it was curious to see how these beetles tried, by dragging at the feathers from below, to pull it into its grave. One of them at last drove the other away, and went on with the work alone for about five hours. He lifted up the bird, changed its place, turned it about, and from time to time came out of the hole, climbed upon it, trod it under foot, and then went down again and pulled it. At last, seeming quite tired with this hard work, he came out, and laid his head upon the earth, near the bird, without moving for a full hour. The next morning the linnet was an inch and a half under ground, with a trench open all round it. In the evening it had

sunk an inch lower, and in another day it was quite covered up. Other small dead animals were afterwards put into the glass case, until, in fifty days, these four industrious little creatures had buried no less than twelve bodies.

Such is the account given by a person who watched them. It is not to provide a store of food for themselves, as you might imagine, that all this labour is undertaken, but that the young grubs proceeding from their eggs may feed in safety: out of sight of birds and other enemies, who would soon find them out and devour them, if they were hatched above ground.

You see how wonderfully God has formed even His smallest creatures; how He has provided food for them; how He has taught them to guard against danger! Can you think then that He will be pleased, if we take delight in destroying these beautiful works of His hands, or in wantonly tormenting them? Children too often do this from want of thought, and some are even so wicked, as really to take pleasure in beholding the agonies of a poor may-fly, pierced through with a pin, or in tearing off the legs and wings of a harmless and inoffensive butterfly. I trust *you* will never be guilty of such inhuman conduct. It is a sin against that God who created both them and you, to inflict unnecessary suffering upon any of his creatures. Ask yourselves, too, how you would like such treatment, from one stronger than yourself. If you meet a beetle or a caterpillar, step aside, and do not wantonly crush it. And should you see a poor earth-worm, lying in the dusty path, parched with the sun, and too much exhausted to regain his home, extend a kind hand to help him, and place him on the nearest cool and moist ground.

He is a harmless little creature, though not pleasing to the eye or agreeable, but he is God's workmanship: and while you are thankful for being endowed with reason, and with an immortal soul, let the inferior creatures enjoy their little lives while they may.

Turn, turn thy hasty foot aside,
Nor crush that helpless worm;
The frame thy scornful thoughts deride,
From God received its form.

The common Lord of all that move,
From whom thy being flowed,
A portion of his boundless love
On that poor worm bestowed.

The sun, the moon, the stars he made,
To all his creatures free;
And spreads o'er earth the grassy blade,
For worms as well as thee.

Let them enjoy their little day,
Their humble bliss receive;
Oh! do not lightly take away
The life thou canst not give.

ANTS.

IN the beginning of this little work it was proposed to give some account of the wonderful way in which insects construct their dwellings; with other interesting facts respecting them. The habits of bees, wasps, and a few others, have come already under our notice. We will now turn our attention to some little creatures, no less industrious, and quite as curious in their ways, I mean the ANTS.

Their habitation is a wonderful building, and consists of numerous halls, chambers, and passages, though outside it appears nothing more than a

little heap of earth, of which substance indeed it is formed. The earth they use is moistened with rain or dew, and their mode of building is to scrape a little grain from the ground, with their teeth, and then to knead and mould it, patting it down with their feet. An ant-hill contains sometimes twenty stories above ground, and as many under-ground; each divided into apartments of different sizes, with arched ceilings, supported by little walls or pillars. When the sun renders the upper part too hot, they carry their young to the bottom of the ant-hill, and in rainy weather, when the ground-floor is unfit to live in, they all remove to the higher stories. One kind, called *wood-ants*, cover their nests with a roof-like thatch; it is made of stems of withered grass and straws. In the morning they take down part of this, so as to make openings to go in and out at; and every night they shut and bar them up, as we do the doors and windows of our houses. Some ants live in trees, where they form rooms and passages, by gnawing out the wood.

In New South Wales there is a species of ants, whose habitation is within the branches of trees; they work out the pith even to the end of the smallest twig; and though nothing is to be seen outside, yet within, the tree is completely filled with insects; and if a little piece is broken, swarms of ants rush out immediately. You may think that it would be very amusing to see this, but I can assure you, you would not wish to try the experiment a second time, for the angry little creatures sting very sharply.

A kind of ants found in South America, construct their nest of green leaves, and place it on the trunk

between the branches of a tree. Some of these nests are as big as a hog's head. This is their habitation during the wet season; when it is dry, they leave their nests, and swarm all over the woods, and on their return, each brings a piece of green leaf, so large, that the insect itself is quite hidden under its burden. Yet they march steadily along, and it is a pretty sight to see so many pressing forward together; the path looks quite green with them. In some places these ants are called *parasol-ants*, from their carrying these round green pieces of leaf. Great paths, three or four inches broad, are made by them, and they will sometimes strip a whole tree of its leaves in one night.

Ants of all kinds live in families: all however that are born in a nest do not remain in it. Vast swarms may be seen in the summer, furnished with wings, and assembling, in order to leave their home for ever. They are sometimes so numerous as to look like a dark cloud floating in the air, and if many did not perish, they would become very troublesome to us. The greater part of these flying ants are either eaten up by birds, or fall into the water, and become the prey of fish. Those which escape through all these dangers, build themselves each a small house, which is soon filled and enlarged by their offspring, until in time it grows into a populous city. And what do you think becomes of the wings, with which I told you each of these ants was furnished? They were intended by Providence only to serve the purpose we have mentioned, and as soon as they have carried her to a convenient place, in which to found her colony, the ant pulls them off herself, and thus is secured from all temptation to wander from her home. These ample

wings were her chief ornament, but they would be a hindrance in the great work she has to perform, and they are sacrificed without a moment's hesitation.

The chief part of the ants in a nest are workers, and they perform all the labour; they have never any wings; and like the working bees, are never parents themselves, but serve as nurses to the offspring of others. The mode of bringing up the young ants, renders their task still more fatiguing than that of the bees and wasps. As soon as the sun's first rays begin to shine upon the nest, the ants that are at the top go down in great haste, to wake their companions; and all the young brood are then carried, and laid in the sun, for a quarter of an hour. After this, they require to be placed in other apartments, where they may be warm, without being scorched: and every evening, an hour before sunset, they must all be carried down into the lower cells, to be safe from the cold. There are seven or eight thousand of these young grubs, in a large nest, so you may imagine that it requires much diligence to do this, besides licking them with their tongues as a cat does her kittens, to keep them clean, feeding them, collecting food, and repairing the nest, which is so easily injured.

If you have ever seen an ant-hill disturbed, you must have observed how anxious all the inhabitants seemed about a number of white substances, something like grains of wheat; how they seized them in their mouths, and tried to carry them into a place of safety, instead of providing for their own escape. These little burdens, which they consider so precious, are the young of the nest; nor is their affection confined to them. When one of their companions is

hurt, they anoint the wounded part with a drop of fluid from their mouth; if a load is too heavy for one, another ant will soon come, and ease it of part of the weight; and if one is attacked, all will hasten to defend it. They are always ready to promote each other's welfare, and to share with the absent any good thing they may obtain. They even seem to rejoice at meeting, after they have been separated: when some ants which had been taken away four months before, were restored to a nest, the others caressed them with their antennæ, or little horns, for so they make one another understand, as the bees do, and admitted them into the family again.

What a lesson do some of these little traits afford to us! They set us an example to relieve and assist the sick, and always to extend help to those who need it. And surely if we, who have so many reasons why we should be kind, and render assistance to each other, are quarrelsome and selfish, envious and jealous of the good things which others possess, and unwilling to give them a share in what we have; these little creatures, so generous and disinterested, may well put us to the blush.

The patience and perseverance of ants are surprising, and in the Bible they are spoken of as affording a most useful lesson. "Go to the ant, thou sluggard," says Solomon, "consider her ways and be wise." The sight of one of these little creatures is said to have had a great effect upon the mind of a celebrated conqueror, named Timour. He was forced to take refuge from his enemies in a ruined building; as he sat alone there many hours, and was almost in despair, his attention was attracted by an ant, carrying something larger than itself up a high wall. He counted the efforts it made to

effect its object, and found that sixty-nine times its burden fell to the ground, but the seventieth time it reached the top. "This sight," said Timour, "gave me courage at the moment, and I have never forgotten the lesson it conveyed." Let my young readers gain the same improvement from it, and when they have anything to do which is difficult, or troublesome, let them go on patiently trying, and generally, like the little ant, they will succeed at last.



There is one most extraordinary circumstance respecting ants, which I must now tell you. You will smile at the idea of their having

APHIS OF ROSE-TREE COWS, yet it is quite true that they MUCH MAGNIFIED. keep certain insects, from which they draw a sweet liquid, in the same manner as we obtain milk from cows, and they even make a property of them. If any stranger-ants attempt to climb the branch of a tree, or the stalk of a plant, where they keep their herds, those who consider themselves the rightful owners, drive them away, and may be seen running about in a great bustle. Sometimes they build a little wall round the place where these cattle are, and so keep them safe in a kind of pen. Some kinds, choosing to have them still more within reach, carry large herds of these insect-cows to their nest, and let them feed on the grass and stalks round which it is built. They take as much care of these creatures' eggs, as of their own, put them in a place of safety when the nest is attacked, and carry them in the same manner into the sun; that by their being hatched early, there may be a good supply of this nourishing food.

Ants are remarkable for courage. Though so

small, they never fear to face any danger, but immediately turn round and prepare to bite, and to shoot their poison into the wound. They sometimes fix themselves so obstinately to the object of their attack, that they will sooner be torn limb from limb than let go their hold; and man himself strikes no terror into them.

These tiny nations, so well armed and courageous, are not always at peace with their neighbours. A square foot of earth is to them a kingdom; their droves of insect-cattle are as valuable to them as our flocks and herds are to us; and the body of a fly, or a beetle, is a most valuable possession. No wonder then if wars and quarrels arise. Myriads may sometimes be seen pouring forth from two rival cities, and meeting half way between their respective habitations, equalling, in numbers, the armies, of two mighty empires. Though they do not cover a space larger than two or three square feet, yet they present a spectacle exactly like that of a field of battle where men are the combatants. Thousands are to be seen struggling together, shooting poison at one another, which fills the air with a strong odour, and is as destructive to them as gunpowder is to us. Thousands of the dead and mangled strew the ground, while others are led away as prisoners; and crowds are seen hastening to reinforce the contending armies.

How the ants know those of their own party, it is impossible to say, as they are generally of the same kind, and appear to us to be all alike in make, colour, and scent. They are not distinguished, as human soldiers are, by different-coloured uniforms, yet it very rarely happens that two of one side attack each other; and if, by chance, they do, the

mistake is presently found out, and they make friends directly. When night comes on, each party returns to its own city, but the next morning the battle is resumed with fresh fury, until at length a rainy season separates them, and the quarrel is forgotten.

Ants not only fight pitched battles, as we have seen above, they also besiege neighbouring cities, and take them by storm. The object they have in view is a most extraordinary one, and could hardly have been believed, if it had not been observed, and related, by so many people. The ants we are now going to speak of are warlike and powerful, but not industrious like most other kinds. In order that they may have slaves to do their work for them, they attack the nest of a dark-coloured kind, called *negro-ants*, and carry off their young. To these, when they are grown up, all the labour is left; they build and repair their common dwelling, collect food, attend to the young, and even feed their masters, and carry them about the nest. Every year the light-coloured ants add to the number of their slaves. At the season when there is a proper supply of workers in the negro ant-hills, they send out spies into the neighbourhood, and prepare for marching. On the return of these spies the signal is made, by touching one another with their antennæ, and they then set out to attack the negro city. Their way of marching is singular; eight or ten ants march first, and these continually wheel round and join the rest of the army, while others succeed to their station.

As soon as the guards of the city perceive the enemy coming, they dart upon them with the utmost fury, and crowds pour forth to assist; but the besieging party rush on, and drive them back, until they

retreat into the lowest story. Numbers enter with them at the gates; while others make a breach in the walls, through which the conquerors march in. Presently they all come out, each carrying a young ant, which has been seized in spite of its anxious guardians: and thus they return in triumph with their spoil. It is a curious sight to behold their slaves, coming out of the nest to meet them, conducting the young prisoners in, bringing food to the warriors, and caressing them, as if they rejoiced at their return. These on their parts are much attached to their faithful servants, and when the nest is attacked by other ants, their first care is to carry them into a place of safety. Having been taken when they were quite young, they do not feel the change, and are quite as happy as they would have been among their own nation, where they would have had the same tasks to perform.

WHITE-ANTS.



KING.



SOLDIER.



LABOURER.

Among all the insects, whose skill in building deserves our notice, none can equal the *termites*, or *white-ants*, found in Africa and the East and West Indies. They are not themselves more than a quarter of an inch high, but their habitations rise generally twelve, and often twenty feet above the ground; that is, more than *five hundred* times their own

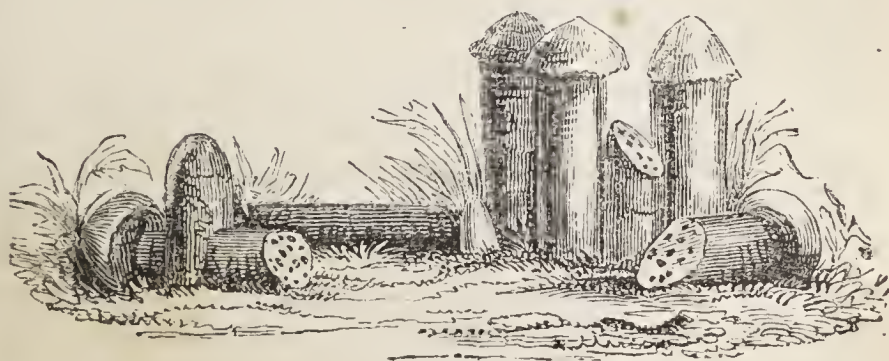


NESTS OF TERMITES; ONE DIVIDED IN HALF, TO SHOW THE INSIDE.

height. If *our* houses were built in the same proportion to ourselves, they would be twelve or fifteen times higher than the famous London Monument, of which I dare say you have heard; and four or five times higher than the pyramids of Egypt, which are reckoned among the chief wonders of the world.

The buildings of the white ants are of a much firmer kind than those of the ants with which we are acquainted, for they have some means of hardening the clay which they use, so that it resembles stone. The nests of some kinds are like a number of sugar-loaves, of different sizes, piled one upon another. They are so hard that you might walk upon them, without any fear of their breaking; and, in the countries we have mentioned, it is very common to see wild bulls standing upon them, to keep watch lest any beasts of prey should attack the herds while they are feeding.

Other kind of *termites* build their nests with flattened roofs, and in the form of turrets, or perhaps they may be better compared to mushrooms, as you may see by the annexed engraving.



TURRET NESTS.

At a certain time in the year, numbers leave their nests, in winged swarms; as we have already related, of the other ants. On these occasions they perish in vast quantities, being eaten, not only by birds, beasts, fishes, and many kinds of insects, but by man himself; they are about the size of a grain of rice, and, when fried, are considered as a great dainty. Now and then a single pair escapes, out of many millions, and if by chance any common or worker-ants meet with them, they immediately choose them for their king and queen, and determine to form a new colony. The first step they take is to enclose them in a chamber of clay, with entrances just large enough for themselves to go in and out at, but not big enough for the king and queen; who, as in the case of the queen-bee, are of a larger kind than the workers; and here they remain for the rest of their lives. Round the royal apartment are built a number of nurseries, and of magazines, or store-houses, in which to keep provisions. To these they are continually adding, for the family becomes daily more numerous, the queen laying as many as eighty thousand eggs, in the course of twenty-four hours. The food they lay up appears, at first sight, like raspings of wood; it is chiefly made of gum collected from plants.

The magazines are built, like most other parts of the nest, of clay, but the nurseries are formed of small grains of wood glued together. A pathway half an inch wide is often made, winding gradually upwards within this high building, that it may be easier to climb with their loads from one part to another; and even a staircase, or kind of bridge resting on one vast arch, is sometimes carried for the same purpose from the top to the bottom of this

wonderful dwelling. Tunnels are bored by these insects all round their nest, to the distance frequently of several hundred feet; they are of enormous size compared with that of the little builders by whom they are made, sometimes measuring nearly a foot across, which is ten or twelve times as large in proportion to themselves as the tunnel under the Thames is, compared in measure with human beings!

Among the white-ants there are some of a different form from the rest, which act the part of soldiers, their business being to defend the nest. Some of them always form a guard round the royal cell, and these faithful subjects never forsake their sovereign, even in the greatest danger. If any one is bold enough to attack the nest, and make a breach in the walls, the labourers immediately retire within, and a soldier comes out to see what is the matter; he then returns to give the alarm, and numbers run out, scrambling as fast as they can, one after the other, with the utmost rage and fury. In their haste they often miss their hold, and tumble down the sides of their hill; but they soon recover themselves, and bite everything they run against. Woe to him whose hands or legs they seize; they will make their teeth meet at the first stroke, and never quit their hold, though they be pulled limb from limb. The naked legs of the negroes suffer sadly from them, and stockings are but a slight defence. As soon as the danger appears to be over, the labourers begin to repair the breach, every one carrying a mass of mortar, half as big as his body. As fast as they come up, each sticks its burden upon the wall; and this is done so quickly and regularly, that though thousands are employed, they never

seem to hinder one another. While this work is going on, scarcely any of the soldiers remain out; one however places himself close to the wall which is being repaired, and seems to act as overseer of the works. Every now and then lifting his head, and striking upon the wall, he makes a noise, which is answered by a loud hiss from the labourers, and appears to be a signal to make haste; for every time it is heard they apply to their tasks with increased diligence.

The mischief done by the white-ants is such as can scarcely be believed. They devour almost every thing they meet with, but wood is their chief food, and they will sometimes destroy a spacious apartment in one night. Having a great dislike to feeding in the light, they make their approaches under ground, either through the floors or by the posts which support the building. Multitudes enter the roof, and form pipes and galleries of clay, which serve for passages, in all directions, and thus they completely take possession of a house.

CATERPILLARS.

WE have seen how carefully bees, wasps, and ants, nurse and tend upon their young, and how ingeniously they construct places of shelter for them. There are various kinds of butterflies, moths, and flies, however, which are destitute, during their first states, of the care and attention of parents or nurses; yet in this early stage of being, without example to guide, or experience to assist them, they show wonderful skill and foresight, in building houses and tents, to defend themselves from the weather, and from their numerous enemies. That gracious Being

who gave them life, has taught them the best means of preserving it, and has made them capable, from their birth, of providing for, and defending themselves.

Here we may remark another instance of divine wisdom. Did all require one kind of food, it must soon be entirely consumed, and all must perish with hunger. But God has so ordered things, that creatures of various kinds, feed upon different substances. Plants afford provision for numbers, and yet no kind of plant is destroyed by having too many dependent upon it for support. Some animals also feed upon others, and prevent them from increasing so as to become hurtful to us. Those which multiply the quickest, have the greatest number of enemies, and yet no species ever becomes extinct.

Sometimes indeed to show His power, or to punish sinful nations, God allows insects to increase to an alarming degree. The plagues of Egypt, of which you have often read, show what fearful instruments the smallest creatures may be, in His hands. Frogs, lice, flies, and locusts, proved no less dreadful to the rebellious Egyptians, than storms of thunder and lightning. He had only to speak the word, "and grasshoppers came and caterpillars innumerable, and did eat up all the grass in their land, and devoured the fruit of their ground." Famine and pestilence often followed the ravages of insects, which are called by the prophet, the great army of the Lord. (Joel ii. 25.)

We do not often see the most formidable kinds in this country; but only consider, how entirely our fruits, nay even our corn, might be destroyed, by

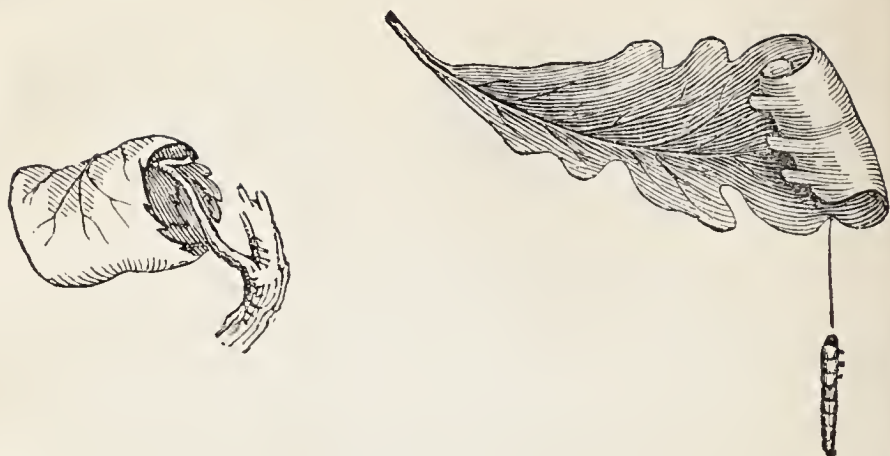
such as are common among us. The Almighty alone can keep them within due bounds. He alone can say to them, "Hitherto shall ye come, and no further." Instead therefore of complaining, when food is not so plentiful and cheap as usual, how thankful ought we to be, that God gives us so much, and that He does not permit it all to be destroyed, as it would soon be without His gracious care.

When caterpillars of the kinds to which we are now about to turn our attention, first come into being, they find themselves surrounded by their natural food. What can be more remarkable than that the parent, though her own is quite different, knows what is suited to the nature of her offspring, and always lays her eggs where the young, when hatched, may find an abundant supply? Notwithstanding this her care, however, they are exposed to many dangers, for want of a house to shelter and conceal them. We will begin with those called *leaf-rollers*, and see how they remedy this want.

You must often have observed the leaves of plants rolled up in a strange manner; and I dare say you have had the curiosity to open them. I can guess what you found; it was a little caterpillar, which tumbled about, seemed in a great fright at being disturbed, and tried to hide himself, by retreating further and further into his house. Perhaps you have been vexed, at having the fresh young leaves of your favourite rose-tree all fixed together, and eaten full of holes, so that they could never open, or what is worse, the buds spoiled, from each of which you expected a beautiful flower.



These little creatures do a great deal of mischief, but much ingenuity is shown in the formation of their dwellings. A leaf is a difficult substance to roll, it breaks easily, and is always ready to fly back into its natural shape. If you never watched a leaf-roller making its nest, come and let us see if we cannot find one. Here is a young caterpillar just hatched, a heavy shower of rain will drown him, or one of the wasps about which we have been talking will seize him, or a bird will carry him off for her young ones, if he does not take care, so he must make haste and form a tent, where he may feed in safety. He is looking about to find a leaf which is not very stiff, and which will bend easily; and now he has found one to his mind, but how is he to roll it up? He has no fingers, and with what is he to fix it? You will presently see that his feet will answer the purpose quite as well as hands, and that he has a little store of silken ropes on purpose to bind it. He fastens several of these little ropes, which he spins out of his mouth, first to the edge, and then to the middle of the leaf, his head moving backwards and forwards, like the pendulum of a clock. Now he is shortening them, by bending them with his feet, and gluing them down; and now the leaf is rolled as neatly as a rocket-case. Here he may feast at his leisure, the inside will serve him for food, and when he has eaten himself out of house and home, he has only to make another.



The leaf-rollers can move as easily backwards as forwards, and if a bird put in his bill at one end of the roll, the insect throws himself out at the other; spinning a thread, by which he may break his fall, and which will also serve him for a ladder to get up again by, when the danger is over.

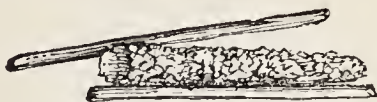
There are many kind of leaf-rollers, which live upon different plants, and make their tents in different ways. One caterpillar, found upon a water-plant, is still more ingenious than the last mentioned. He gnaws a circular piece out of a leaf, and carries it to that on which he intends to live. These leaves are not quite flat, but rather hollow like a spoon. By turning the underside of that which he has cut to the underside of the other, and fixing the edges together, he forms a hollow cell, with an opening only large enough to put his head out at. This caterpillar makes himself, besides, a *moveable* dwelling: having cut an oval piece as before, and laid it on a leaf, he cuts a second piece out to the same size, and fixes the two together, and this serves him as a little boat to travel about in.

Other caterpillars form tents of the outer skin of a leaf: cutting two pieces of an equal size, and joining them into the form of a pear, they then gnaw away the end which is still fixed to the leaf, so that the tent can be carried about as the shell of a snail.

Some very droll little moveable houses are made by a caterpillar living upon the willow. You must have seen the blossoms of the willow, which come out as one of the first signs of spring; some children know them by the name of *pussy-cats*, and they are worn on Palm Sunday. These, when they ripen, are covered with soft down. The little creature, of which we are speaking, burrows into one of them, and then detaches it from the branch where it grew. Thus a very warm covering is made, which he can carry about with him, and which looks just like a little white muff. But it has another advantage besides being warm; as the willow generally grows near the water, the caterpillar is sometimes in danger of drowning, being blown off the tree by the wind. The light materials of his tent, however, serve for a life-boat, and keep him up till he is floated to shore.



LEAF-CASE.



REED-CASE.

There is a very interesting class of grubs living under water, well known to fishermen by the name of *case*, or *caddis-worms*. They form moveable tents of various substances. One glues leaves together into a very pretty case; another uses reeds or straws, cut into bits, and joined carefully together, with one piece longer than the rest, placed over

the opening, to shade its head, and prevent its being seen; a third makes choice of fresh-water shell-fish and snails, and forms a complete grotto, which it carries about, keeping these poor creatures close prisoners; a fourth makes its abode of small stones, and it is curious to see how carefully these are chosen, so as to make the inside quite smooth and even, and the bottom flat; that it may be dragged along easily. If you recollect how full pebbles are of sharp corners, and rough edges, you will see how very hard a task it must be to choose out such as will suit the purpose. Yet by patiently turning them on every side, the insect at last succeeds. If the materials prove so light that there is danger of being swept away by the stream, a larger stone is added by way of ballast; if, on the contrary, the case should prove too heavy, a hollow straw or some light thing is added, to keep it up.



SHELL NESTS OF CADDIS-WORM.

Besides these, which form slight or moveable habitations, there are other kinds of caterpillars which construct much more substantial dwellings. One, living upon old walls, peels off little bits of moss, and fixes them with the roots inwards, so as to form a sort of vault. When finished this looks exactly like one of the patches of moss growing, only it is rather higher than the rest. Some burrow a hole in the wall, and build an arched roof over it, with little pieces of brick or mortar. The *goat-caterpillar* feeds upon wood, but not content with

the long galleries which he has eaten out, this little carpenter, when winter draws near, scoops out a convenient apartment in the tree, and lines it with a substance as warm and thick as broad-cloth, which he makes out of the raspings of wood, spun up with silk: and here he spends the winter, secure from the cold, and remains without food until the warmth of spring calls him out again to eat more voraciously than ever, after so long a fast.

The variety to be met with in the structures of these insects is endless, and I cannot attempt to tell you about all. One of them may rather be considered as a garment, than a tent or house. I mean that made by the caterpillar of the clothes-moth. This little animal, and the mischief done by it, are known and dreaded by most people, yet, as has been well remarked, "it has something to plead for our pity; it came, like man, naked into the world, and destroys our garments, not in malice and wantonness, but that it may clothe itself with the same wool which we have stripped from the sheep." This vesture is never changed, but that which the caterpillar puts on in infancy, continues to shelter it during life. It can, however, be enlarged at pleasure; to lengthen it is very easy, by adding a few new hairs at each end, but to widen it is much more difficult. If it were split open, from one end to the other, it would separate too far. The insect, therefore, first cuts each side about half way down, and then after having filled up the openings, proceeds to cut the other end, so that four enlargements are made, and four separate patches put in,



CLOTHES-MOTH
CATERPILLAR.

The colour of the case is always the same as that of the stuff from which it is taken. If the original colour be blue, and the insect be afterwards moved on to red cloth, the circles at the end, and two stripes down the middle will be red, and the rest blue, so as to look like a Scotch plaid-cloth, or sort of check.



SILKEN TENT OF SOCIAL CATERPILLAR.

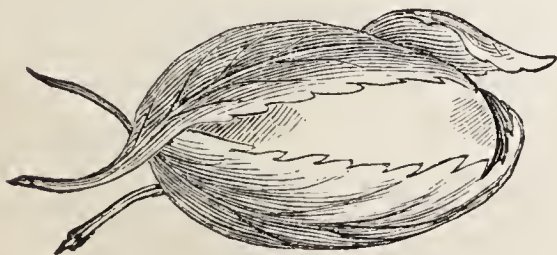
Some caterpillars, instead of living alone, associate with others, and form a large tent for their common habitation. You must often have seen these silken tents upon trees and plants, and you may have observed the insects making their way out to devour all the neighbouring leaves. However far they may have rambled in search of food, they always find their way back again easily, when night or a shower of rain drives them home. A little carpet of silk is spread in the path by those which go first, and those which come after follow in the same tract, often marching in long files as regularly as soldiers.

Travellers in South America describe a very curious kind of nest, formed of leaves bound together with silk, and hung from the branch of a tree, in which several caterpillars were found living together.

When caterpillars have passed the appointed time in their first state, they prepare for the wonderful change which awaits them, in a manner not less curious and interesting. If we were going into a deep sleep in the midst of enemies eager to destroy us, we should try to find some spot where we might remain concealed during this hour of peril. Insects seem to act upon the same principle, and to be aware of their defenceless state. Some have been taught to weave for themselves a silken case which they sometimes conceal with leaves; others hide themselves under ground, and in an earthy tomb seek rest and safety: while others creep into a hole or corner, and hang themselves up, out of the way of the enemies who would devour them. We will describe the proceedings of one of the latter, as the most worthy of attention.



PENDULOUS
LEAF-NEST.



LEAF-NESTS OF THE CHRYSALIS.

When the moment of change approaches, the caterpillar spins a little silken net, which is firmly fixed in some safe place, and to this it fastens itself by the two last feet, with its head hanging down. It then curves its back more and more, until the skin bursts, and the chrysalis which is underneath can be seen through. This is a work of four-and-twenty hours at least, and of much labour. It then twists and twirls in various ways, until the skin is nearly pushed off, when the insect seizes it between two of the rings of its body, and draws its tail entirely out. The chrysalis has now got free from its former covering, but hangs in the air in great danger, clinging to this withered skin. The legs by which, as we have said, it fixed itself at first, belonged to the caterpillar-form now laid aside; and how do you think that a creature, without limbs, and with its head downwards, can climb up again, or fasten itself to the net? Destitute and helpless as it appears, it is not left without resources. It lengthens the part of its body that is above the rings by which it holds, and seizes with two higher rings, another part of its caterpillar skin. Having in this manner advanced three or four steps, it feels about with its tail, for the net of silk, and fixes itself to it by means of hooks with which it is furnished. Still it is not contented without getting entirely rid of the old skin; it therefore gives a jerk, which causes both its own body, and the cast-off covering, to spin round eighteen or twenty times. The latter generally gives way, and the chrysalis quietly allows it to drop; if the first twirl does not succeed, it tries turning the other way; though, after all it is sometimes obliged to give up in despair.

'The position we have been describing does not suit

all caterpillars, some spin a girth, or belt of silk, into which they creep; and thus hang suspended in a kind of hammock or hanging-bed, such as sailors use on board



ship. This is a no less curious proceeding than the last. But we must now take our leave of this insect, which, having passed through its first change, will remain as if dead for a time, until at length it bursts its coffin, and it comes forth with quite a different form; no longer doomed to crawl about upon the earth, but able to roam from flower to flower, and to soar into the air on light and buoyant wings.

Do not these changes remind you of our own? We are often compared in the Bible to worms, and you yourselves must see, how much our condition in this world resembles theirs. After a time, we, like the chrysalis, become stiff in death, and are committed to the tomb; but we, too, shall burst our prison, and come forth, with a nature as far superior to that which we have at present, as the lovely butterfly is to the mean caterpillar from which it proceeds. Let the sight of this insect bring to our minds the humility which ought to be felt by beings, who are but as worms in God's sight, and let the great and beautiful change it undergoes, lead us to look forward to the glorious hopes of a happier state.

Shall the poor worm that shocks thy sight,
The humblest form in Nature's train,
Thus rise in new-born lustre bright,
And yet the emblem teach in vain?

Ah! where were once her golden eyes,
Her glittering wings of purple pride?
Concealed beneath a rude disguise,
A shapeless mass to earth allied.

Like thee, the hapless reptile lived ;
Like thee he toiled, like thee he spun ;
Like thine, his closing hour arrived,
His labour ceased, his work was done.

And shalt *thou*, numbered with the dead,
No happier state of being know ?
And shall no future morrow shed
On *thee* a beam of brighter glow ?

Is this the bound of power divine,
To animate an insect-frame ?
Or shall not He who moulded thine,
Wake at His will the vital flame ?

But, if we desire to partake of this happiness, we must remember, that as God has given instinct to the inferior creatures, and *they*, by fulfilling the ends for which they were created, contribute to set forth His praises; so has He given to *us* reason, and His sacred word, for our guides, and *we* must strive to glorify Him also by our earnest endeavour to fulfil the duties He requires of us. Death will then be to us but the entrance into life, for He, who is both the Creator and the Saviour of all the ends of the earth, has promised to all who live as His faithful servants, that He “will change their vile body, that it may be like unto His glorious body,” as you have heard it expressed in the beautiful service for the Burial of the Dead.

THE SPIDER.

WE have, hitherto, been considering the abodes which insects form, for their own protection, or that of their young. You shall now hear something about the ingenious workmanship of others, whose object it is to ensnare the animals upon which they

feed. Spiders are among the most common of these; they are indeed disagreeable creatures, but their habits are so curious that they cannot fail to interest, and the wonderful provision made to fit them for their mode of life, renders them most worthy of attention. The spider is spoken of in the Bible as a thing which is "little upon the earth, yet exceeding wise;" she "taketh hold with her hands," says Solomon, "and is in king's palaces." When things come every day under our notice, we are apt to grow accustomed to them, and to lose that feeling of wonder, which the works of God are calculated to awaken; were not this the case, we could never behold a spider's web without astonishment. What, as a learned and ingenious author remarks, if we had not seen it, would appear more unlikely than that any animal should spin threads, and weave them into nets, such as no fowler or fisher could excel; and then hang them in the very places where the wished-for prey is most abundant, and watch, in concealment, its approach? Were this done by larger creatures, how would it excite our admiration! How would the world crowd to see a fox, for instance, which should spin ropes, weave them into a net, and hang them between two trees, for the purpose of catching birds? Or should we ever cease to wonder at a fish who should obtain its food by such a contrivance? Yet there would be nothing in this more surprising than in the same thing done by spiders; indeed, the smallness of the creature renders it more wonderful.

Though formed for purposes of destruction, the spider's web is more delicate and beautiful than the work of any other insect. No one, who has ever been out on a bright summer-morning, can have

failed to admire the fine lace-work of silvery threads which adorns every bush, and almost every blade of grass. How beautifully do the long rows of dew-drops which hang to these webs, tremble with every breeze, and sparkle in the beams of the newly-risen sun! It is no wonder that the victims for whom the snares are spread, fly into them so readily, and fear no danger. Were they to see their terrible enemy herself they would avoid her, but she is very cunning, and generally keeps out of sight.

There are many kinds of spiders of very different sizes; some are at least two inches long, and able to devour birds; but all in this country are much smaller. They are generally of a dirty brown colour, though some *field-spiders* are prettily marked with green and black and white stripes. This insect has eight eyes, which it cannot shut or move, but as some are placed in front of the head, some at the back, and some on the sides, it can see everything that passes around. Its head is armed with two stings, which have rough edges like saws, and end



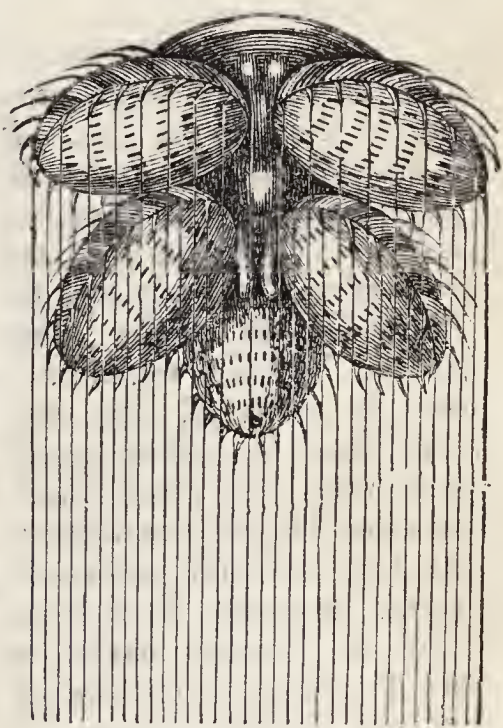
MUCH MAGNIFIED.

in a nail, like the claw of a cat. When not wanted for use, this nail is bent down like a knife upon its handle, and near the point is a small opening, through which a liquid poison is forced out. With these fearful weapons the spider

soon destroys any creature it can seize, and woe to the unlucky animal that falls into its power! Each of its eight legs is furnished with three moveable claws; one is small, like the spur of a bird, and placed on the side; the two others are longer; and with these it can fix itself wherever it pleases, and

move in every direction. Besides these eight legs, the spider has two other limbs, in the fore-part of its body, which may be called arms, as they are only used for turning and holding its prey. You would scarcely imagine that such a dreadful creature should require nets to catch the insects upon which it feeds; but if you remember that *they* have wings, and *it* has none, you will see that it could not easily overtake them, and that these snares are very useful to entrap them as they fly.

For the purpose of forming its web, the spider has a most curious spinning-machine, much less simple than that of the caterpillar. It consists of four little knobs, which we will call spinners, enclosed by a ring, and pierced with a multitude of holes, so numerous, and so extremely fine, that there are above a thousand in each of these four divisions, a space itself not bigger than the point of a pin. From every one of the holes a thread proceeds, so that the very



SPINNING APPARATUS OF A SPIDER
MUCH MAGNIFIED.

finest part of a web, which we can scarcely see, is not a single line, but a cord, composed of at least four thousand *strands*, as a ropemaker would call them. If you examine closely, you may see, with your own

eyes, that these threads are not single, but the number of their parts cannot be counted without the assistance of a microscope. The microscope is a kind of glass that magnifies things, or shows them much larger than they are.

The line spun by the smallest spider, itself no bigger than a grain of sand, is so fine that *four millions* of them put together would not exceed the thickness of one of your hairs, and each of these threads is formed, as we have already said, of above four thousand still finer. How many then would be contained in the thickness of one human hair? These are rather large numbers to multiply, so I must do the sum for you. Four millions multiplied by four thousand, make *sixteen thousand millions*. This is so wonderful that we can scarcely imagine it possible. Who can form an idea of a thread *sixteen thousand millions* of times finer than a hair.

How far are all the contrivances of human skill excelled by the machine with which this little insect is provided, for weaving its delicate web! Were there no other proof that the world, with everything in it, was formed by an Almighty Being, this alone should be sufficient to convince us. When you find all this curious machinery contained in a space so small, that your senses can scarcely perceive its various parts; when your imagination cannot even form an idea of their extreme fineness; does not this make you feel humbled under a sense of imperfection, and does it not raise your ideas of our GREAT CREATOR, till you are ready to exclaim, as David did, when he had been meditating upon the works of creation, "Lord, what is man, that thou art mindful of him, or the son of man that thou visitest him?" Surely, then, when we

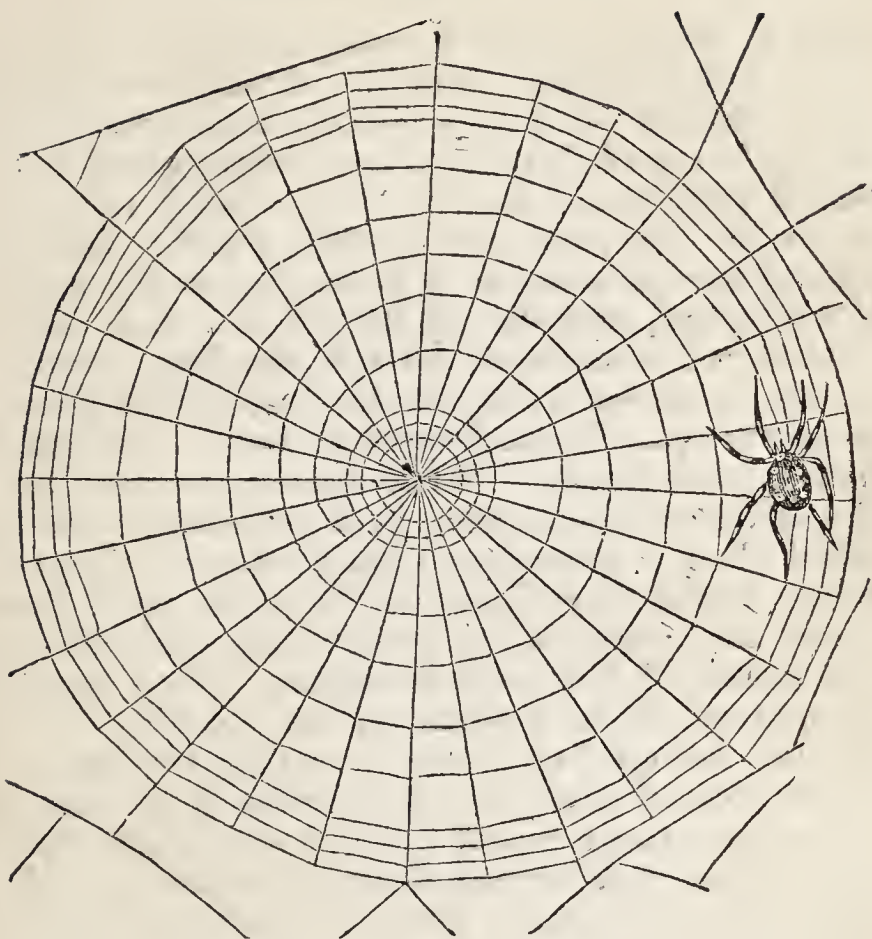
thus see God's power, and our weakness, we should learn to leave all our affairs with confidence in His hands; to submit, with cheerfulness, to everything with which He may see fit to afflict us; and to believe, that He knows best what is really good for us, though it may not be pleasant at the time. If we cannot trace the wonders even of the thread which He enables an insect to spin, though it is before our eyes, how can we expect to comprehend the unsearchable wisdom with which He governs the world?

You, perhaps, wonder why such curious contrivance is bestowed on these threads, instead of their being quite simple. The great Maker of all things does nothing in vain, and always makes use of the means best suited to the purpose. Their being so many times double, adds much to their strength, for it is well known in manufactures, particularly in rope-spinning, that cords formed of many smaller ones are much stronger than those which are spun at once. There is most probably another reason for this admirable provision in the spider. Its threads being composed of gum, are moist, and require to be dried quickly: this is done much sooner than it otherwise would be, by their exposure to the air in separate divisions before they unite into one, at the distance of about the tenth part of an inch from the body of the insect. There is also a third advantage in this multitude of threads; when the spinners are pressed against anything, for the purpose of fastening a line to it, they spread over some space, and so fix it by several thousand points, instead of one; forming a kind of flattened end, which is very firm. The spider has the power of closing its spinners when it pleases, so that when dropping from a

height by its line, it can stop at any point, and remain hanging in the air, in which situation it is often to be seen.

You must have observed that there is a great variety in the appearance of spider's webs. Those which are generally found in houses, look only like a piece of gauze, or thin muslin. Some have the addition of a number of single threads, fastened to their edge, joining and crossing each other in every direction, and carried up often to the height of several feet. These lines are very much like the tackling of a ship, and insects can scarcely avoid flying across them. Striking against these ropes they become entangled, and in struggling to get free, generally fall into the net spread underneath to receive them. That she may keep quite out of sight, and not frighten away her victims, the spider often adds a little silken apartment below the web, and in order to know when anything is caught, she spins several threads from the edge of the net to that of her hole: these, by moving, give notice of what has happened, and serve as a bridge upon which she may run in a moment to secure her prey.

But the most beautiful webs, by far, are those so often found on shrubs and hedges, formed with regular rays like the spokes of a wheel, and with a number of circles one within another. The spiders which form them are called *geometrical spiders*. It is most interesting to watch the weaving of one of them, and you may probably have opportunities of seeing it for yourselves, if you choose; but, in the mean while, I will try to explain how the difficult task is accomplished.



GEOMETRIC-SPIDER'S WEB.

The first care of this insect is to form lines; of sufficient strength to bear the net which she means to hang upon them, and to serve as a kind of selvage. After having carried a thread across, from any one place to another which may suit her purpose, she makes it several times double, by gluing to it five or six other threads, and renders it firm by fixing it to various other points with smaller lines. She then tries its strength by pulling it with her feet; and not content with this, she drops herself down from

several parts of it, and swings with the whole weight of her body. Several of these main lines being formed in various directions, she fastens a thread to one of them, and walks along guiding the thread with one of her hind feet, that it may not touch in any part and become glued. Having crossed over, she fastens it to the line on the opposite side, and, from the middle of this thread, which is to form the centre of the net, she fixes a second, which in the same manner she conveys and fastens to another part of the foundation lines. The work now goes on rapidly. While forming the first lines, the spider rests sometimes, as if to think where it will be best to place them; but as soon as they are firmly stretched, and two or three rays spun from them, she continues her work, so fast that the eye can scarcely follow her movements. Above twenty rays, placed at equal distances, and meeting in the middle, are quickly finished; giving the net the appearance of a wheel. The spider then runs to the centre, turns herself quickly round, and pulls each thread with her feet, to try its strength, breaking any one that seems weak, and spinning another in its place. Next she glues, close round the centre, five or six little circles, not more than the twenty-fourth part of an inch distant from each other, and then four or five larger ones, half an inch or more apart. The last serve as a sort of scaffolding to walk over, and to keep the rays properly stretched, while she glues the other circles which she now proceeds to form. Placing herself at the outside, and fastening her thread to the end of one of the rays, she walks up towards the centre of the web. When she has gone so far that the thread drawn from her body is just long enough to reach to the next

ray, she steps across, and guiding it with one of her hind feet, she glues it on with her spinners. Thus she goes on, round and round the web, until she has filled up nearly the whole space; leaving only a little interval between these and the smaller circles, which, as I have said, were first spun. Lastly, she runs to the centre, and bites away the small tuft which united all the rays, leaving them held together only by the circular threads; and so this beautiful net is finished. But it is very easily injured, and would be of little use, were not the insect provided with the means of repairing it, and of forming a new one. In time however the whole supply of gum is dried up, and all the old spider can do then is to drive a younger one out, and take possession of its web; should this attempt fail, it must perish with hunger.

When a spider has completed her snares, she hides herself, as you have already heard, and the moment an unfortunate fly, or other insect, touches the net, feeling the lines move, she rushes out and seizes it with her fangs. If it be small, she carries it off at once to her hiding-place, which serves also for a slaughter-house, and having sucked out the juices, throws away the carcase. Sometimes a wasp or large bee is caught, which is so strong that the spider knows it is more than a match for her; in this case, she often assists its escape, by breaking the part of the net to which it hangs, glad to get rid of so dangerous a guest, even at this price. In general, however, she wraps the larger insects round with threads, in a most skilful manner, until, their legs and wings being fastened, they can no longer struggle, but may be carried off without resistance to her den.

I lately saw a curious instance of this. Passing by the web of a large garden-spider, a round ball of white silk, which hung in it, attracted my attention. While I was wondering what this could be, and how it came there, the owner of the web made her appearance. She began, in a most skilful manner, to break all the threads which held it, spinning at the same time another thread, one end of which she fastened round it, and the other to one of her own claws. All this was done in a moment, and she ran off to her hiding-place, with the ball slung to her foot, and hung it up among a number of dead flies, gnats, and other insects. Wishing to find out what this strange-looking thing could be, I put my hand into her den and took it out. While I was turning it about, it moved, and appeared to contain some living creatures. A very small pair of sharp-pointed scissors soon cut the silken bag open, and a fine young bee began to struggle for liberty. His legs however were so twisted round with silk, that it was some time before they could be set free. With the help of a pin, this was done at last, and none of his delicate limbs were broken: but the terror he had suffered, from finding himself in the power of such a dreadful enemy, made the little victim tremble so, that he was unable to fly, and there was reason to fear that the spider had already poisoned or wounded him. This did not however prove to be the case, for he had not long been placed under a glass, with some flowers, before he began to suck honey from them, and after a few hours, being set at liberty, he flew away, quite well and unhurt. Few insects have escaped from so dangerous a situation as this little bee; and in another minute, it would have been too late to save his life. The

spider had not quite so much cause to rejoice, but she could very well spare this victim, having her larder already so well stored with provisions.

The bodies of spiders being hairy, would always be covered with fragments of their gummy threads, if great care were not taken to prevent it. They may often be seen slowly combing off the flue, and tossing it away, and when they let themselves down by a line, they coil it up into a little ball, on ascending again, and throw it away. Two of the claws which have been described as belonging to spiders, are toothed like a comb, and are equally fitted for the above purpose, and for running along the lines. But this formation does not enable them to walk, as flies do, upon any upright polished substance, such as glass; they have however the means of constructing a *rope-ladder*. This is done by raising the spinners as high as possible, and pressing them against the surface. A step is thus formed, upon which the insect stands to form a second, in the same manner, and so on, as any one may see by putting a spider at the bottom of a very clean wine-glass.

These insects can also make bridges, by which they may cross brooks or ditches, and transport themselves from one tree to another. For this purpose they fix a thread to the spot where they may be, and wait until the other end of it is blown by the wind to some neighbouring tree, or other object, and by its natural gumminess has stuck to it. They try whether it is firmly fixed by pulling at it repeatedly with their feet, and finding it so, trust themselves to this slight bridge, and pass safely across, drawing a second line after them, as a security, in case the first should give way.

You will be surprised to hear that some spiders are able to float in the air, in the same manner as you would fly a kite, and sometimes to such an astonishing height, that people, standing on the top of a very high church-steeple, have seen these *gossamer-spiders*, as they are called, above them. Their way of flying is this; they climb to the top of a gate, a blade of grass, or anything else which will raise them a little above the ground. When their thread is drawn out, by the current of air, into fine lines several feet in length, they know that it will enable them to float: they then quit their hold of the object on which they stood, and begin their journey aloft. These spiders also spin webs upon the ground, which may be seen ascending in the middle of the day, carried up by the currents of heated air; on these they sail as in a balloon, for the purpose, it is supposed, of catching insects. Their webs resemble the finest ravelled silk, and are sometimes more than a yard long, and several inches wide, though they are generally much smaller, and measure only a few inches each way. In the evening, when the air is cooled, they fall, and sometimes in such quantities as to look like a shower of silver; you have perhaps often seen them lying thick upon the ground, covered with dew-drops.

There are some kinds of spiders which form a nest under ground, not for the purpose of catching other insects, but as a safe abode for themselves and their families. These *mason-spiders* are found in the West Indies, in France, and in many other countries, but not in England. By means of their strong jaws, they dig a deep hole in a clay-bank; always making choice of ground which is very steep, that the rain may run off. Having made this hole, at least two

feet deep and an inch wide, the next thing is to line it, from top to bottom, with a web of fine silk. This lining serves to prevent the earthen walls from falling in, and by being joined to the door of the house, it also enables the spider to know what is passing above, for the whole moves when any part is touched. You may suppose, that in speaking of the *door*, I only mean the entrance to this abode; and not a door such as ours, made to fit the opening exactly, and with a hinge to turn upon. Yet such a one, this little creature really makes; and, perhaps, among all the ingenious labours of insects, which we have been considering, this is the most wonderful. It is formed of several coats of dried earth, fastened together with silk; when finished, it is as round as a plate; the inside is a little hollow, and lined with a smooth web; but the outside is made rough, that it may look exactly like the surrounding earth. This door is fixed by a firm hinge of silk, which moves up and down with the greatest freedom, and allows it to be opened and shut with ease. The hole being dug on a sloping bank, one side must of course be higher than the other; and care is always taken to place this hinge on the highest side. If you think for a moment, you must see the reason of this. The little insect knows that when so placed, the door, if pushed open from within, will fall down by its own weight and close; which would not otherwise be the case. It is not less curious, that a little groove, or ledge, is always left at the top of the entrance, upon which the door shuts. Into this it fits so neatly, that the place where they meet can scarcely be seen.

Such is the dwelling of the *mason-spider*; nor is its way of defending its house less surprising

than the skill with which it builds it. The loudest knocking will not bring the cunning inhabitant out of its cell, but if the least attempt be made to force the trap-door open, a most curious scene takes place. The spider, warned by the moving of the threads, which, as you have been already told, reach to the bottom of the nest, runs with all speed to the door, fastens some of its legs to the silk lining, and the rest to the walls, and, turning on its back, pulls with all its force. Observers have convinced themselves of this fact by lifting up the door with a pin, and have felt the spider pulling against them. Such a weak little creature is, as you may imagine, easily conquered, and, finding resistance useless, runs away to the farthest part of its dwelling. In order to see what the spider would do, weights have sometimes been laid over the door, so that it could not open, and the next morning a new door has been found at a little distance. If the door be entirely taken away, another will be made in a few hours, and generally without a hinge, the creature no doubt thinking thus to remain in safety, until all fear of another attack shall be over. This kind of spider hunts by night only, and devours its prey at the bottom of its den, which is generally strewn with the remains of slaughtered insects. A pair of spiders, with as many as thirty young ones, sometimes live together in one of these curious chambers.

The *water-spider* is another which spins no web to catch its prey, but its habits are most wonderful. It forms for itself a dwelling with the last thing you would imagine could be used for such a purpose—with bubbles of air; and its beautiful little palace may often be seen, in ditches about London, shining

through the water like a globe of silver. This creature spins some loose threads, which it fastens to the leaves of water-plants, and by covering them over with the gum contained in its spinners, which is like melted glass, it forms a cell about the size and shape of half a pigeon's egg,



with a large opening below. Having covering its own body partly over with the same gum, so as to make a little bag, the spider comes up to the surface of the water, and draws in as much air as this bag will hold. Then plunging again to the bottom, it conveys the bubble of air under the roof which had been made to receive it. This is done ten or twelve times, until enough air has been carried down to fill the apartment. Here the spider lives, and is kept quite dry, though under water; and to this little airy dwelling, all the insects caught, whether on the land or in the water, are carried. You may have heard of diving bells, in which men go down to the bottom of the sea to collect pearls, coral, sponges, and various other things, and by which they are enabled to remain under water for above an hour; these are made exactly on the same principle as the spider's dwelling, and much in the same shape:

Another spider, often found in the fen-ditches of Norfolk, forms a *raft*, in order to obtain its prey more easily. With slight silken cords it fastens

some weeds together into a ball, about three inches across, and upon this floating island it is carried about the water, ready to pounce upon every drowning insect it may see; not with the humane intention of saving it from death, but in order to seize and carry it off to its raft, where it may be devoured at leisure.

THE ANT-LION.

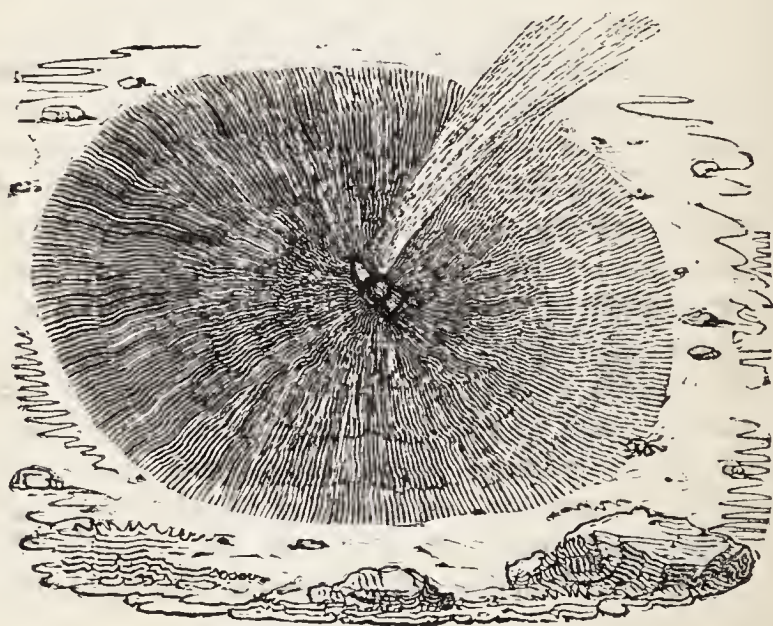
SPIDERS are not the only insects which lay snares for others: among several which obtain their food by these means, the most curious is one called the *ant-lion*; which, as its name implies, feeds upon ants. It is the grub of a winged insect not unlike a dragon-fly; but during its first state, in which it continues two years, it much resembles a little gray-coloured creature, which you may have seen, called a wood-louse. It is about half an inch long, and appears one of the most helpless animals in the world, being only able to move backwards, and that very slowly, so that it never could overtake an active ant; but it looks very dreadful with its long fangs, like two reaping-hooks crossed. It has, however, been furnished by Providence with the means of supporting its existence.

When first hatched, it seeks a soil of loose and dry sand, near which its parent has taken care to place it: In this it traces a circle, and begins to dig out a hole in the shape of a funnel; this is done in a most singular manner. Placing itself in the middle of the circle which it has drawn, it thrust its body partly into the sand, and with one of its fore legs, which serves for a shovel, charges its flat and square head

with a load, which it immediately throws over by a jerk, to the distance of several inches. When the first circle is hollowed out, the insect traces a second and smaller one inside it, and by doing this repeatedly, forms at last a deep hole, wider at the top than at the bottom, and with sloping sides like a funnel. One circumstance deserves particular notice; in order to shape it properly, it is necessary to use only one leg at a time; but as it would be very fatiguing to employ one limb in doing the whole work, the ingenious creature, when it has finished the first circle, takes care to turn the contrary way in forming the next, and thus uses both legs by turns, without tiring either. In the course of its labours, small stones are often met with, and these are placed, one by one, upon its head, and jerked over the edge of the pit. But sometimes, near the bottom, a pebble will present itself, of such a size that the head of the animal is not large or strong enough to bear the weight, and what is to be done then? The patient insect does not despair, but lifting the stone on its back, it carefully walks up the side, and places it beyond the edge. If, by chance, the stone should be round, the task is still more difficult.

The *ant-lion* is seldom, if ever, found in this country, so you have little chance of seeing it. But no one, without feeling interested in its success, could see the little labourer lift the stone, with great difficulty, and begin its toilsome journey. The burden totters every moment, first to one side, then to the other; and at last when the top of the pit is nearly reached, it perhaps meets with a jolt, and loses all its trouble, the stone rolling down again to

the bottom. When this has happened, the insect, not discouraged, renews the attempt, and the second time generally succeeds, taking advantage of the channel made by the falling stone, against which it supports its load; but sometimes the same accident happens five or six times, but it is not till after many failures, that the attempt is given up, and a new pit begun.



DEN OF THE ANT-LION.

When one of these pits is finished, it is about three inches wide at the top, sloping gradually down to a point, and about two inches deep. At the narrow end of this, the *ant-lion* takes its station, and covers itself, all but the points of its formidable jaws, with sand, that the insect-passengers which come by its den may not be frightened away. The

moment an ant approaches the edge, the sand slides from under its feet, its struggles only make it descend the faster, and it falls headlong into the jaws of the devourer. Sometimes, however, an ant is able to stop before it reaches the bottom, and begins in great haste to scramble up again. The ant-lion soon perceives this, for being furnished with six eyes on each side of its head, it is very sharp-sighted, and hastily shovelling loads of sand upon its head it throws them one after another at the retreating insect, which cannot stand against this heavy shower from above, while treading such a slippery path. So down the poor ant goes at last, and the instant its victim is within reach, the ant-lion seizes it, and having finished its meal, repairs the injuries done to its pitfall.

I have now mentioned nearly all the insects, which are most remarkable for their skill in forming habitations, or other structures; and my little book is very nearly ended. It has been written for your amusement, but it was intended for your improvement also, and I shall be very sorry if you are not the better for having read it.

Before I quite take my leave of my young readers, I have a few more words to say, about the wonders which we have been considering together; and I hope you will not think these reflections dull, or feel impatient to have done with them. I dare say, that until you were told all these things about insects, you had no idea what wonderful creatures they are. Indeed, their being so small, perhaps caused you to pay little regard to them. But all the works of our Creator are worthy of our attention; and they are made so beautiful, as well as useful, that we cannot

but admire them. The wonders of nature are open to the view of every one, and we should not shut our eyes to such amazing proofs of the wisdom and goodness of God.

I have endeavoured to teach you how to behold some of these wonders profitably; and when you see any of the little creatures, about which you have heard so much, may they bring to your mind some useful lesson, encouraging you to industry, to perseverance, to patience, and to many other good qualities, of which we have seen that they are patterns! When you are inclined to hurt or tease them, may you remember the lines against treating them cruelly*, which you have here read, and perhaps have learned by heart; and then I am sure, that instead of acting like the evil spirits, which delight in tormenting, you will strive to resemble our blessed Saviour, who was always mild and merciful!

But there is one thing, above all, about which I am anxious; it has been my chief endeavour, throughout these pages, to lead you to think oftener of God, and to teach you to see His hand in everything around you. The air we breathe, the sun which shines over our heads, the grass beneath our feet, all speak the praises of their great Creator; all declare with one voice, "the hand that made us is divine!" Yet in nothing are His skill and providence more strikingly shown, than in the wonderful forms and instincts bestowed upon these, the smallest of His works: they are everywhere to be met with, and always within reach of our observation, whether we live in the town or in the country.

* See page 49.

Surely no person can think of them long, without being ready to say with the Royal Psalmist, "O Lord, how manifold are thy works, in wisdom hast thou made them all, the earth is full of thy riches!" May the study of them, therefore, raise your thoughts to God, and impress deeply upon your minds these great truths, that He is Almighty, all-wise, all-good; that His watchful providence is ever, and everywhere at work, for the preservation of all that He has made!

But when you have learned thus to read the perfections of their great Author, in the works of nature; you must remember that it will do you no good to know that God's power is boundless, if this knowledge does not make you fear to offend Him: it is of no use to be sensible of His infinite wisdom, if you do not submit your will to His; nor to be aware of His never-failing goodness, if this does not lead you to love Him. And if you feel as you ought to do, that He is everywhere present, you will act as if under His all-seeing eye.

The works of nature cannot teach you how to do all this; you cannot learn from *them* how to serve and please God. But there is a book which contains His revealed will, and from that alone can the way of salvation be learned. THE HOLY BIBLE is that book. While therefore you admire the wonders of the world around you, and profit by the lessons they afford, be thankful that you have still further means of knowing the power and the love, the perfections and the will, of the great Being who formed them; and that you are not left to the dim light of nature, as the heathen are. It is your blessed privilege to be born in a land

where the light of revelation shines, and you have the further privilege of having been taught to read. Study diligently then the written word of God, which alone can be "a light to your feet, and a lantern to your paths;" and strive in all things to obey the glorious Being, whose wondrous works are everywhere around us.

THE END.

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